Imperial Bureau of Plant Genetics

(For Crops other than Herbage)

Plant Breeding Abstracts

Vol. IV, No. 2.

School of Agriculture
Cambridge
England

January 1st, 1934

TABLE OF CONTENTS

		PAGE
519	Statistics*	120
575	Genetics* (Empire)	105
	(Foreign)	120
576.1	Origin of Species	106
576.3	Cytology*	122
581	Botany*	122
63	Agriculture	123
631.421	Field Experiments	107
632	Plant diseases (Empire)	107
	(Foreign)	123
633	Economic plants (Empire)	108
	(Foreign)	124
633.1	Cereals (Empire)	109
	(Foreign)	125
633.11	Wheat (Empire)	109
	(Foreign)	128
633.13	Oats	136
633.14	Rye	138
633.15	Maize	139
633.16	Barley (Empire)	111
	(Foreign)	142
633.17	Millets and Sorghums (Empire)	111
	(Foreign)	143
633.18	Rice (Empire)	112
	(Foreign)	143
633.4	Roots and tubers	144
633.5	Fibres (Empire)	112
	(Foreign)	147
633.6	Sugar plants (Empire)	115
	(Foreign)	150
633.7	Stimulants (Empire)	116
	(Foreign)	151
633.85	Oil plants	116
634	Fruit trees (Empire)	116
	(Foreign)	153
634.9	Forestry	162
635	Vegetables (Empire)	119
	(Foreign)	164
	Book Reviews	167

* General studies, see also individual crops.

Plant Breeding Abstracts.
Vol. IV, No. 2.

Part I. British Empire

GENETICS 575

292. Weiss, F. E. 575.061.633
Variegated foliage.
Proc. Linn. Soc. Lond. 1932/33 : Part III, 135-49.

In this comprehensive and suggestive discussion of the problem of variegation in the flowering and non-flowering plants the successive contributions of various workers on the subject are considered.

The author is inclined to the view that in many cases which apparently conflict with the Mendelian laws of inheritance the protoplasm of the generative cells and even its inclusions, the plastids, play their part in determining the inheritance. Moreover, if this be true for variegation it is possible " that in other cases where inhibitory factors have been assumed to be present in the nucleus the inhibition may have its seat in the protoplasm or plasmon ".

The fundamental problem still confronting the plant physiologist and geneticist is why green and white plastids should occur so distinctly segregated in definite groups of cells.

The study of somatic segregation and differentiation should constitute an important step in the elucidation of the problem of variation and heredity.

293. Gates, R. R. 575.17
The general nature of the gene concept.
Nature 1933 : **132** : 768-70.

The implications arising out of the phenomena of stability and inherited change exhibited by the gene-plasm have formed the basis of the gene concept.

With advancing knowledge the former morphological outlook has been rejected in favour of an essentially physiological view point according to which the gene, as a living unit, is regarded as an organized system, thus partaking of the nature of all organic units. The nature of this organization leading to the conception of the gene is discussed from the point of view of the visible differences arising from initial germinal differences and of the theories of chromosome structure and evolution.

Most biologists are now agreed in locating the genic material in the chromosomes. In the light of work actually in progress it seems possible that chromomeres may not exist, at least in plant cells, and that the absolute discreteness of the genes within the chromonemata is not an essential part of the gene theory. The evolutionary aspects of this statement are examined with special reference to the development of the mitotic mechanism in the presumably undifferentiated, individually homogeneous chromosomes of Protista. The evolution of higher plants and animals may have occurred through internal differentiation of their chromosomes combined with the adhesion of the products of cell division into multi-cellular aggregates. Mutation of chromosome portions of various sizes would then account for any differences that probably exist in gene size. The inert or empty segments found in chromosomes may perhaps represent an earlier unmutated condition of the chromosomes.

Most of the available evidence leads to the inference that genes are ultra-microscopic bodies, but not necessarily indivisible units. On the view that the gene is an entity incapable of being fractionated, the facts explicable on the step allelomorph theory are difficult to interpret.

The divisibility of the gene has also been advanced to explain variegation in plants, though high mutability is a possible alternative explanation.

294. PETO, F. H. 575.24:581.036
633.15:576.312.36:575.243
633.16:576.312.36:575.243

The effect of aging and heat on the chromosomal mutation rates in maize and barley.

Canad. J. Res. 1933 : 9 : 261-64.

The evidence here presented is in favour of the mutationist conception of evolution, but also suggests that environment may play a large part in influencing the mutation rate.

Observations on maize seed from 1 to 6 years old corroborate the work of Navashin on the chromosome mutation rate in aged seed of *Crepis* (See " Plant Breeding Abstracts," Vol. IV, Absts. 1 and 82).

As regards the action of heat, the mutation rate of barley seed was increased in an equally marked degree by both temperatures of 95°C. acting for 25 minutes and 40°C. for 30 days in an unventilated germinator. This suggests that certain adverse environmental conditions in nature may be just as effective in producing chromosome changes as is aging under natural conditions.

It is interesting to learn that examination of seminal root-tips shortly after germination and 40 days after seeding shewed a reduction of from 68 per cent to 20 per cent in the number of mutant plants. This suggests that the theory of the survival of the fittest may apply to cells and that under disadvantageous conditions mutant types may occur in profusion and many may be eliminated at an earlier stage than was hitherto believed. Any dominant advantageous mutants, on the other hand, would undoubtedly have survival value.

ORIGIN OF SPECIES 576.1

295. RITCHIE, J. 576.12
576.1

The origin of species.

Nature 1933 : 132 : 506–7.

Modern scientific thought tends to reject the possibility of fortuitous minute variations acted upon by natural selection as a sufficient explanation of evolution ; and vitalism in its various guises including the acceptance of the existence of life as an inexplicable but necessary basic assumption, as suggested in the physico-chemical theory of Professor Bohr, is now receiving serious consideration. A co-ordinating theory of aristogenesis which unites extreme vitalism and the physico-chemical point of view has now been put forward by Dr. H. F. Osborn. Aristogenesis which is based on inductive investigations is defined as " the gradual, secular, continuous, direct, reactive, adaptive origin of new biomechanisms. It is a creative process from the geneplasm (or germplasm) of entirely new germinal characters . . . a secular genetic and adaptive reaction rather than an immediate adaptive reaction to new habit or environment as in Lamarck's theory."

Aristogenesis finds expression through (*a*) " aristogenes " governed or predetermined by germinal potentialities in certain lines of descent so that in closely related stocks, however widely separated geographically, parallel aristogenes arise ; (*b*) " allometrons ", *i.e.*, changes of proportion or intensity not germinally predetermined in certain lines but arising independently within species or races.

Adaptations according to such a view are not the result of the experimental selection of chance variations, but definitive steps in an orderly direct series—a view with obvious teleological implications.

296. DARLINGTON, C. D. 576.16:576.312.32

Chromosome study and the genetic analysis of species.

Ann. Bot. Oxford 1933 : 47 : 811–14.

Since the study of the chromosomes of related species at mitosis has demonstrated that the main divisions of the taxonomist are sustained by the cytologist, the systematist can therefore apply cytological discoveries to the elucidation of species problems that have defied analysis on taxonomic lines.

Further and still more conclusive evidence in species problems can also be derived from the observation of meiosis in hybrids between related forms, for, from the chromosome associations occurring at metaphase, diverse changes in genetic structure can be inferred. From such behaviour of hybrids it has been possible to conclude that most related species differ in chromosome structure.
Differences exist between the connotations of the term hybrid as defined by the cytologist and geneticist on the one hand and the taxonomist on the other and many taxonomic species are recognized by the cytologist as hybrids.
The development of new forms is favoured not only by geographical but also by genetic isolation due to structural and numerical changes in the chromosomes. These latter changes, though they do not as a rule establish those morphological differences which are the essential criteria of species, are nevertheless an important factor in permitting the development of such differences (by gene mutation) in the strains they isolate.
It is clear that cytological and complementary genetical work can advance the study of species chiefly by the analysis of their internal constitution.

FIELD EXPERIMENTS 631.421

297. YATES, F. 631.421
The formation of Latin squares for use in field experiments.
Emp. J. Exptl. Agric. 1933 : **1** : 235–44.
The principles of replication in agricultural field trials are discussed, and the failure of systematic square arrangements to give a valid estimate of error demonstrated. The conditions for an unbiassed estimate of error are laid down, and it is shewn that these are satisfied by any particular Latin square if rows and letters are permuted. It is then shewn how a random square is to be selected from all the possible squares, up to 6 by 6, which is as far as the squares have been enumerated. Beyond this sample squares are given up to 12 by 12, from which by permuting rows, columns and letters, sets of squares are produced amply large enough to serve all agricultural purposes.

298. BOSE, R. D. 631.421:519.24
Application of modern statistical methods to field trials.
Agric. and Live-st. Ind. 1933 : **3** : 330–40.
The author seeks in this paper to impress the importance of modern methods of field experimentation on the minds of agricultural workers throughout India. Soil heterogeneity is described, and the recommended methods are gone over. Details are given on the questions of lay-out and the interpretation of results according to the methods of " Student ", Engledow and Yule, and Fisher.

PLANT DISEASES 632

299. 632.484 *Helminthosporium*:575.24
DICKINSON, S. 632.484 *Fusarium*:575.24
The nature of saltation in *Fusarium* and *Helminthosporium*.
Tech. Bull. Minn. Agric. Expt. Sta. 1932 : No. 88 : Pp. 42.
The results shewed that heterocaryosis is not responsible for saltation in *H. pedicellatum*, Henry ; *H. monoceros*, Drec ; *H. F. fructigenum*, Fries ; and *F. vasinfectum*, Atk. var. *lutulatum*, and also that the difference between a saltant and its parent strain is not cytoplasmic in nature.
These two findings lead to the view that in the cases in question the saltations are due to changes in the nucleus itself.
The nature of saltation in certain species of *Helminthosporium* and *Fusarium*.
Ann. Bot. Oxford 1933 : **47** : 920–21.
A brief account of the work described in the above Bulletin.

300. SMITH, E. H. G., VOELCKER, O. J. and WEST, J. 633:575(66.9)
Plant breeding in Southern Nigeria.
Trop. Agriculture 1933 : **10** : 312–17.

Preliminary work in plant breeding is undertaken with a maximum number of crops and of varieties or strains of each crop. Once pure lines have been obtained by selection for yield and generally disease resistance too, a definite breeding programme can be started as has been done with cotton and edible beans.

The chief experimental station in the south is at Ibadan. The botanical work in progress or contemplated at the sub-stations is briefly outlined.

Oil palm. Government encouragement of native owned plantations of oil palm has resulted in a demand for high yielding trees. Different varieties are being tested and development and the genetics of fruit form are being studied. Individual yield records have been kept for the past 11 years of the plantation palms at Calabar, which includes the recognized 6 Nigerian fruit forms.

Self-fertilization by controlled pollination of selections from the highest yielding of all 6 forms has been begun, in order to test the kernel and oil yields of the selections (Cf. " Plant Breeding Abstracts," Vol. II, Abst. 552) and of the different fruit forms. In addition the progeny of the various selections of each fruit form are being tested *inter se*. The inheritance of fruit form is also being observed in a number of crosses. Finally leaf production, flowering and fruiting is being investigated.

Cacao. The yellow Forastero, chiefly of the amelonado type, predominates in the south-western Provinces. Selection was begun in 1930 on groups of trees of which individual records have been kept for 12 years, and of which several types are regarded as genetically superior for yield. Selection tests on a larger scale and disease resistance trials are to be continued. By controlled pollination an adequate supply of seed from self-fertilized selected parents has been obtained for planting in 1933. Various questions of methods of cultivation are being investigated and also the relative merits of cross and self-pollination are to be examined. At Ibadan self-fertilized seed has been used to provide stocks on which scions from the selected parent trees will be budded. Ultimately it is hoped that it will be possible to distribute seed from proved parent clones.

Kola. Selection work has been handicapped by the absence of individual records of yield and of type, but observations have been started on mature and on younger trees. Systematic work on controlled pollination is contemplated on lines similar to those used for cacao. In the preliminary selection yield and the cotyledon colour, an important factor economically, must be considered.

Citrus. Systematic selection has now been undertaken at two stations but test plots will be extended to all stations within the next few years. Tests of grapefruit and sweet orange scions on various stocks have been begun and new scions from imported budwood were introduced last year. It is also hoped to produce high yielding local strains.

Coffee. No coffee breeding can be contemplated for several years. Liberian types (*Coffea liberica* Hiern.) are grown with success. Robusta types are included in the initial collection of different varieties which has been undertaken and data on yield and suitability will soon accumulate. The desired type may possibly be obtained from some country where coffee breeding has made good progress.

Cotton. Selection was begun in 1923. The indigenous cotton *Gossypium peruvianum* Cav. of the south-western Provinces which has proved incapable of improvement and Allen cotton (*G. hirsutum*), an unsuitable type, have been superseded by a selection, Improved Ishan Strain A, bred from a variety of *G. vitifolium* Lamk. indigenous to Ishan. An annual single plant re-selection of the improved strain is still continued. The strain is entirely suitable but has somewhat coarse lint. From crosses between Ishan A and a sister strain Ishan E to improve the lint several promising strains have been fixed by continual re-selection and are now undergoing a preliminary field trial. Recently Ishan A has been crossed with Sea Island cotton (*G. barbadense* Linn.) and back-crosses are to be made with Ishan A for several generations in hopes of grafting a superior lint on Ishan cotton.

Edible beans. With the object of obtaining a type suitable for food and also adequate as a green manure, selection was begun in 1927 with Lima types of *Phaseolus lunatus* Linn., and later exotic varieties and a large collection of local beans were tested. A selection of the indigenous Popondo (*P. lunatus* forma *macrocarpus* Van Es.) appears promising. Improvement of the present white beans of Popondo is also being attempted by natural crosses between the local selection and various introduced types.

Cassava and Yams. A collection of cassava material has been tested in observation plots and the varieties are now grouped for trials *inter se.* Taxonomic characteristics and also yield, quality, time of maturity and mosaic resistance are being observed.

From a collection of Nigerian yams 157 samples have been planted and their taxonomy, agricultural value and disease resistance are to be recorded.

Maize. No actual research has been attempted with maize, though ear to row selection is practised by agriculturalists at Ibadan.

Spices. A representative collection of chillies has been grown and found to consist of about equal proportions of *C. annuum* Linn. and *C. frutescens* Linn. The great diversity of fruit form noticed is probably due to an admixture of types in the samples and the heterozygous nature of the varieties themselves. The main types are to be multiplied to obtain commercial reports. Similar work has been begun with peppers.

Minor crops. Collections of pineapples and bananas are being made this year.

Material of the miscellaneous perennial economic crops is to be grown and a preliminary study of native vegetables and other indigenous annual crops of economic value carried out.

Plant diseases and their control are also being investigated and selection for resistant types among yam varieties is to be attempted while the selection of cassava for mosaic resistance is in progress.

CEREALS 633.1

301. CALLAGHAN, A. R. 633.1.00.15(94.2)
An outline of work in progress, or contemplated, at Roseworthy Agricultural College, additional to activities connected with the training of students.
J. Dept. Agric. S. Aust. 1933 : **36** : 1344–49.

An explanation of the general principles followed in the production of improved varieties of cereals is elaborated by a description of the aims of this research centre in the breeding of wheat, barley and oats. The economic aspects are not forgotten.

WHEAT 633.11

302. GANGA RAM, P. 633.11(54.5)
A promising wheat for Kangra Valley.
Seasonal Notes Punjab Agric. Dept. 1931 : **8** : No. 2 : 41–42.
SINGH, R. D.
Punjab 9-D wheat.
Ibid 1932 : **10** : No. 2 : 45–48.
ANONYMOUS.
A new variety of wheat.
Ibid 1933 : **11** : No. 2 : 13–14.

The new variety 9-D is a white fully bearded wheat with white felted ears and amber, plump kernels. It is of rapid growing and erect habit, ripening about a week earlier than type 8–A, and gave under conditions of either moisture shortage or normal irrigation combined with late sowing or with low soil fertility, a higher yield than any other variety in the Punjab. It is, however, unsuited to conditions favouring luxuriant growth, for lodging then reduces the yield.

303. SINGH, C. R. 633.11(54.5)
A new improved high yielding variety of wheat for the Punjab.
Seasonal Notes Punjab Agric. Dept. 1933 : **11** : No. 1 : 39–40.

This new high yielding cross-bred wheat No. 518 is a bearded, amber-grained type with white

felted chaff, blackish awns, dense erect ears and comparatively short and stiff straw. The hybrid is suited to heavy fertile soils but not to poor or ordinary land. Lodging occurs only on exceptionally fertile soils. The milling and baking qualities are satisfactory.
Other crosses are still under observation.

304. WENHOLZ, H. 633.11:575(94.4)
Breeding wheat for improved quality.
Agric. Gaz. N.S.W. 1933 : **44** : 595–601.
Against an economic background, the problem of wheat improvement in Australia is outlined from its early stages, in which quality was the major consideration, to the present day, when efforts are being made to produce a combination of suitable quality and yield in both hard and soft wheats.
Farrer's early work is described and also his achievements in extending the wheat belt into drier districts and in the production of early maturing varieties combining productiveness with suitability to dry districts and a high gluten content.
The diagnostic importance of gluten quality in wheat breeding and the Pelshenke and Cutler-Worzella tests are mentioned. In New South Wales Pelshenke's dough test (Cf. " Plant Breeding Abstracts," Vol. I, Abst. 340) has been applied to all commercial varieties and baking tests are in progress with promising new wheats and the results as a whole should prove valuable in the selection of parents.
The significance of climate in relation to quality, is recognized and the present policy is to grow comparatively early varieties of high baking quality in the earliest and driest districts and comparatively late wheats of low quality in the coolest and most favourable tablelands. By this means it is hoped to regulate the quality of the early and late varieties and of the yields for hot and cool districts.

305. 633.11:576.354.46
HUSKINS, C. L. and HEARNE, E. M. 633.13:576.354.46
Meiosis in asynaptic dwarf oats and wheat.
J. R. Micr. Soc. 1933 : **53** : 109–17.
Meiosis was studied in the pollen mother cells of some 40-chromosome " B " series fatuoid dwarf oats, special attention being paid to the prophase stages.
At leptotene a precocious splitting of the threads was observed in several cases, there were definite irregularities in the degree of contraction and a number of free ends indicated that a " continuous spireme " was not formed.
The beginning of pairing of terminal chromomeres was observed in zygotene and there was much irregularity in the degree of contraction. No normal pachytene pairing was observed.
A large number of univalents was already present at early diakinesis and most of the chromosomes were univalents at late diakinesis. Bivalents for 0–14 occurred at metaphase as well as occasional multivalents and cells with 80 chromosomes.
Anaphase, telophase, interkinesis and the homoeotypic division were extremely irregular leading to the production of sterile pollen grains.
In the small amount of material from the dwarf speltoid wheats examined some nearly normal metaphases were observed but in general the irregularities were as numerous as in the oats.
As normal pairing occurs in other kinds of dwarf wheat it is assumed that the " C " chromosome which is lacking in both the dwarf forms of fatuoid oats and speltoid wheats described, carries the gene or genes determining normal pairing. As the heterozygous 41-chromosome plants shew practically normal meiosis almost complete dominance of the factor is probable. The facts are taken as being in accord with Darlington's hypothesis of the correlation between mitosis and meiosis and support the modification of it suggested by Huskins in which the early splitting of the chromosomes is primary and the contraction secondary. A discussion of this conception leads to the suggestion that similar causes may determine the irregularities which cause the formation of mammalian tumours.

BARLEY 633.16

306. Lewis, R. M. 633.16:581.46:575.11
Awned hoods in barley.
Sci. Agric. 1933 : **14** : 48–49.

In 1929 in the Province of Honan a type of barley was discovered with a hood-like structure situated about half way up the awn, and with the portion of the awn above the hood flexed. Such "curly" barley was fairly widely distributed and occurred in fields of normally awned barley. This intermediate form bred true and resembled the true breeding progeny of hybrid origin reported by Biffen in 1907.

The relation between awns and hoods can be explained on the basis of G. von Ubisch's (1916–23) genetic formulae, if natural crossing between awned and hooded forms and the persistence of a homozygous segregate be assumed.

MILLETS AND SORGHUMS 633.17

307. Venkatraman, S. N. and Subramanyam, P. 633.174–1.551:575
Biometric studies in sorghum. The relation of yield to other characters in *Andropogon Sorghum*.
Ind. J. Agric. Sci. 1933 : **3** : 609–25.

Pure lines numbering 34 and plants from a strain T.6 of the "*pacha jonna*" variety of sorghum formed the material for this investigation of the relation between yield and weight, length, circumference of head, diameter and length of peduncle, height of plant and emergence as measured by the distance from the flag junction to the base of the head.

The circumference of head shewed the highest correlation with yield, the effect of the other characters, diameter of peduncle, height of plant, or emergence being variable or of a small order as in the case of length of head.

Genetic variation between one strain and another may be masked by environmental influences.

308. Rangaswami Ayyangar, G. N., Vijiaraghavan, C., Sankara Ayyar, M. A. and Panduranga Rao, V. 633.175:575.061.6
Studies in sorghum—The Great Millet, II. Anther, stigma and grain colour affinities.
Ind. J. Agric. Sci. 1933 : **3** : 605–08.

A parallel series of depth of colour from deep yellow to hyaline or very light yellow is found in the stigma and fresh anther. The colour of the dry anther has been used to differentiate plants having different constitutions. The colour may be brown, red or sienna with a range of colour in the latter group. Generally, yellow grained plants have sienna dry anthers, red grained, red anthers and brown grained, brown anthers. The group of white grained forms can, however, be classified into groups on the basis of the colour of their dry anthers.

309. Rangaswami Ayyangar, G. N., Vijiaraghavan, C., Pillai, V. G. and Sankara Ayyar, M. A. 633.175:575.11.061.6:581.45
Inheritance of characters in sorghum—The Great Millet—II. Purple pigmentation on leaf-sheath and glume.
Ind. J. Agric. Sci. 1933 : **3** : 589–94.

Pigmentation of the vegetative organs develops late but colour differences can be determined especially in the leaf-sheath, long before they appear in the glumes or grain. Two types are recognized, a brown colour and a purple colour with a deeper variation of the latter, in which the colour is practically inky. The colour appearing in the glumes at a later stage accords with these leaf-sheath colours.

The inheritance of these colours is studied. A single factor (P) develops the purple colour from the brown and a factor (q) converts purple into blackish purple. Purple is dominant to brown but blackish purple is recessive to the lighter reddish purple. A record is given of a large number of families shewing the segregation of the characters.

310. RANGASWAMI AYYANGAR, G. N., VIJIARAGHAVAN, C., SANKARA AYYAR, M. A. and PANDURANGA RAO, V. 633.175:575.11.061.6:581.48
Inheritance of characters in sorghum—The Great Millet, III. Grain colours : red, yellow and white.
Ind. J. Agric. Sci. 1933 : 3 : 594–604.

There is, in all the forms studied a basic yellow colour (Y) developing a yellow colour in the aleurone layer. A second factor (R) develops a red colour but, in the absence of a third factor (W), this colour is limited to the base of the grain and, in those varieties in which the glume gapes, the colour is lost through bleaching. The factor (W) also acts as an intensifier of the yellow colour. A fourth factor (I) converts red into pink but is inactive in the absence of (R) or (W). Where the forms (RW) and (Rw) cannot be separated by a study of the grain, the withered anthers will give a clue, being either red (RW) or sienna (Rw). A record of numerous families shewing the segregation is tabulated.

RICE 633.18

311. RODE, K. P. 633.18:576.356.5
A triploid plant in rice (*Oryza sativa*).
Current Sci. Mysore 1933 : 2 : 170–72.

A triploid rice plant that arose probably by fusion of a diploid and a haploid gamete in the fourth generation of a varietal cross exhibited marked sterility, setting only five seeds out of nearly 800 spikelets. Its cytological behaviour is described.

FIBRES 633.5

312. AFZAL, M. 633.51(54.5)
A short note on a new American cotton (N.T.1).
Seasonal Notes Punjab Agric. Dept. 1933 : No. 1 : 11 : 40–42.

This improved variety, N.T.1, a bulk selection made in 1926 from 280–F, is described and the results of comparative trials are given.

633.51:575(54)
313. 633.51–2.484–1.521.6(54)
Improvement of Broach cotton.
Ind. Cent. Cott. Comm. 1933 : Pp.3.

Breeding work at the Broach farm has resulted in the production of a type of cotton, Broach Deshi 8, which is highly resistant to wilt and of excellent fibre qualities. It is now being crossed with high ginning cottons to improve the ginning out-turn. Another form Selection 10, recently isolated promises to be fairly resistant to wilt and also to have a high ginning percentage.

633.51 Verum:575(54)
314. 633.51–2.484–1.521.6(54)
Some problems of cotton growing and its rotation crops in the Central Provinces and Berar and the work hitherto done on them by the Botanical Section, Nagpur, and at the Akola Farm, under the auspices of the Indian Central Cotton Committee, Bombay.
Ind. Cent. Cott. Comm. 1933 : Pp.4.

The new Verum cottons bred under the auspices of the Indian Central Cotton Committee, to replace the variety " Roseum " which are susceptible to wilt is not only resistant but also possesses a longer staple, fine and soft and capable of spinning 22s counts as against 8s for " Roseum." A new type Late Verum cotton has been produced for districts which get late rains, and another promising type Early Verum should prove adapted to districts with light soils and less rainfall. In order to increase the yield of cotton a rotation that includes groundnuts is recommended and selection for yield and quality of Japan and Spanish groundnuts is in progress.

315. 633.51:575(62)
633.11:575(62)
SEIDEMANN, A. 633.16:575(62)
État actuel et premiers résultats des travaux d'amélioration exécutés en Egypte sur le coton et le blé par le Dr. B. Kajanus. **(The present state and the first results of the breeding work on cotton and wheat carried out in Egypt by Dr. B. Kajanus.)**
Bull. Un. Agric. Égypte 1932 : **30** : 65–74.

A description of the work of the late Dr. Kajanus on selection and hybridization of cotton, wheat and oats.

Two types of cotton, Maarad and Zagora, afters election for 5 generations have shewn a definite improvement in yield and quality. The length of the fibre in millimeteres was 42·2 for Maarad and 31·0 for Zagora. Samples have been sent to Europe for spinning tests.

Various other selections are mentioned of which certain Fouadi, Pilion and Nahda forms have given excellent yields of good quality for several consecutive years.

Two improved *durum* types of " Baladi " wheat have also been isolated.

Five generations of individual selection of the indigenous varieties of barley has resulted in the production of 2 " Baladi " types of superior yielding capacity. In addition 10 forms have been selected from the varieties " Baladi " and " Mariout ".

316. PEAT, J. E. 633.51:575(68.9)
Some notes from the cotton station, Gatooma.
Rhod. Agric. J. 1933 : **30** : 739–49.

The most satisfactory strain U4/46 (Gatooma No. 5), bred from the original U4 stock is a hardy medium-sized F_1 form without a great deal of leaf, is fairly early and sets fruit readily and recovers well after drought or bollworm ; its resistance to jassid attack is probably commercially satisfactory and it has a ginning percentage of about 33. Under multiplication it is still segregating, but other selections such as Gatooma No. 511 and No. 521, and several others that have been bred from it are most promising in various respects.

317. MILES, L. G. 633.51:575(94.3)
633.71:575(94.3)
A Queenslander abroad. Travelling research scholar's report.
Qd. Agric. J. 1933 : **40** : 346–48.

Observations on cotton and tobacco breeding and cultivation in Virginia, North and South Carolina.

At Oxford N.C. Tobacco Sub-station, selection for yield, quality and greater uniformity had been in progress for some time, and also a few strains resistant to black root rot (*Thielavia basicola*) had been developed.

At the Agricultural College at Raleigh N.C., existing varieties such as the Mexican Big Boll cotton are being subjected to selection ; and up to 1930 the strain Mexican 6–1–9 was the highest yielding variety in most of the state. In 1933 newer selections of high promise have been isolated. The varieties best adapted for various localities are enumerated, and the improvement in staple length by continuous selection and other measures such as the establishment of " one variety communities " in which farmers agree to grow seed of the one variety recommended as best for the locality is described.

At Hartsville, S.C., attention is concentrated on improving staple length and spinning quality and inducing a heavy early set of bolls to combat the boll weevil. The cross-bred variety Farm Relief has many of the desired characteristics. A large number of valuable strains evolved from the Cleveland variety and from Delta types are briefly described. Among the wilt resistant varieties bred from the Cleveland types is the highly resistant Clevewilt ; but the problem of physiological strains of the pathogenic organism has now arisen.

At Hartsville too varietal tests of bright flue-cured leaf tobacco, followed by pedigree selection, have resulted in the promising new strain Gold Dollar.

Breeding for uniformity in cigarette tobacco is said to offer much scope for future work.

Finally success has been achieved in the production of cold and smut resistant oats for hay and grain.

318. 633.51:575.11.061.6
633.51:575.127.2

AYYAR, V. R. and IYER, R. B.

Lint colour in Asiatic cottons.

Current Sci. Mysore 1933 : 2 : p. 128.

From ratios obtained in F_2 and F_3 progenies of interspecific crosses of *Gossipyum obtusifolium*, *G. indicum* and *G. herbaceum* a 3 factor basis for lint colour in these cottons is postulated. A basic gene X, essential for colour but producing pigmentation only in the presence of either K_1 or K_2 or both is regarded as the probable factor relationship. The factor X, with either K_1 or K_2 gives cream ; X, with K_1 and K_2 gives brown.

Further work is in progress.

633.51:575.42:578.08

319. BROWN, C. H., SELIM, ABD EL GHAFFAR and YOUSSEF, A.

Hair weight target diagrams in cotton breeding.

Bull. Tech. Sci. Serv. Cairo 1933 : No. 125 : Pp. 3.

This Bulletin is a brief description of the application of the " target diagram " method, developed in Egypt, to the problem of fineness. The material analysed consists of 25 plants each of four strains of Ashmouni and four of Sakel from the Purity Chequer of Giza 1932, each group of 25 plants being selected as the most typical by targeting all the characters hitherto measured. For each group hair weight multiplied by its own square root is targeted against weight of 100 seeds and the square root of hair weight against halo length.

The targets, which are given in detailed diagrams, show a positive correlation between hair weight and seed weight but no correlation between hair weight and halo length. Of further interest is the rather surprising range of hair weight especially in the Ashmounis indicating the independence of the segregation of this character. The bearing of these results on the choice of nucleus stock for multiplication is discussed.

Mercerized diameter measurements of the two highest and two lowest hair-weights of each strain were also made and the higher hair weight was found to give the coarser diameter. Here both genetic and environmental influences are at work and the data throw little light on the question whether diameter is a stable factor for a genetically pure strain.

320. 633.51:576.356.5
633.74:576.356.5
576.356.5:576.12

DAVIE, J. H. 635.648:576.356.5

Cytological studies in the *Malvaceae* and certain related families.

J. Genet. 1933 : 28 : 33–67.

For different species of ten Malvaceous genera, seventeen new chromosome numbers are recorded ; and species of *Hibiscus*, *Gossypium*, *Thespesia*, *Cienfugosia* and *Theobroma*, were included in the main study. In general there was considerable uniformity in the size and shape of the chromosomes. The tendency to group association of chromosomes at metaphase is regarded as an indication of the polyploid nature of most of the genera examined which are presumably derived from an ancestral type with the basic number 7. In *Theobroma*, however, the diploid number suggested a basic number 10 and not 7 as recorded by Kuyper and Cheesman.

The polyploidy on a basis of 7 attributed to *Gossypium* and other genera is reconciled with the diploid numbers recorded by postulating fusion of two pairs of chromosomes into one long pair ; and the possible course of events in the evolution of the various types of *Gossypium* from the ancestral type is outlined.

Observations of mitosis and meiosis confirmed and extended the theory of secondary association of chromosomes in ploypoids, and in *Thespesia* and *Gossypium* in particular.

In contrast to Darlington's findings definite evidence of secondary pairing in somatic tissue was observed.

The extent of the agreement between the taxonomy and the cytology of the *Malvaceae* is examined from the phylogenetic standpoint and four cytologically independent types of evolutionary change are recognized in the *Malcaceae* so far examined, *viz.* polyploidy, tetraploidy

on a basis of 7, hexaploidy and octoploidy through the tetraploid form from the ancestral diploid as in *Hibiscus africanus majus*.
The origin of the genus *Gossypium* appears to have involved tetraploidy on a basis of 7 followed by fusion of two pairs of chromosomes into one pair, thus giving n = 13 as the fundamental number for the genus. From the so-called diploid Asiatic cottons, which are really modified tetraploids, have arisen the so-called tetraploid American cottons, which are phylogenetically modified octoploids. The "tetraploid" American cottons have not necessarily a common ancestor. Amphidiploidy has probably occurred in the different hybrids which resulted from crosses between various related ancestral diploid species. In this way the American cottons, with 2n = 52, may have arisen from separate ancestors.
A bibliography of 50 references is included.

321. Jaganatha Rao, C. 633.51:581.46:575.11
A note on the occurrence of small outgrowths on the calyx ring of the cotton flower.
Madras Agric. J. 1933 : **21** : p. 394.
A description of an anomaly occurring in a pure line of cotton No. 54, a 'Northerns' Selection (*Gossypium indicum*), grown at the Research Station, Nandyal. In F_1 hybrids the character has proved partially dominant.

322. Venkatraman, S. N. and Jaganatha Rao, C. 633.51–1.557:575
The relation of size and shape of plant to the yield of cotton.
Madras Agric. J. 1933 : **21** : 51–58.
The 5,970 plants examined were the progeny of 46 single plant cultures of *Gossypium indicum*. It was found that in plants of the same strain the number of monopodia and plant height were markedly correlated with yield. The genetic relation from strain to strain was, however, different. While taller types were not necessarily good yielders strains with more monopodia were more productive. The height of the strain was of little genetic importance so that selection for yield on a height basis will be useless, while selection of monopodial types will be of more permanent value.
This relation of yield to monopodia was much higher in the type of cotton tested than in the more sympodial types such as Americans or Uppams (*G. herbaceum*). Selection for yield on the basis of monopodia is justifiable in "Northerns" cotton.

323. 633.51.00.15(54.5)
Cotton research in the Punjab.
Ind. Cent. Cott. Comm. 1933 : Pp. 4.
Several new strains of American and Deshi cottons are being tested, including a new high yielding early strain with big bolls and long lint. Some success has been attained in breeding naked-seeded, long-stapled varieties.
Disease and insect problems are also receiving attention.

SUGAR PLANTS 633.6

324. Sikka, L. P. D. 633.61 Coimbatore
Distinguishing characters of the important varieties of sugarcane and their comparative merits.
Seasonal Notes Punjab Agric. Dept. 1932 : **10** : No. 2 : 48–49.
Brief notes on the 4 Coimbatore varieties, Co. 205, 285, 223 and 213 and their merits are accompanied by a table giving the yield and economic value of the gur produced by each type.

325. Menon, T. G. 633.61(54.8)
Main points of some of the improved sugarcane varieties from the cultivator's view point.
Madras Agric. J. 1933 : **21** : 352-55.
Descriptions with average yield and sucrose percentage of 10 new canes now distributed for cultivation or under test on a large scale.

326. KERR, H. W. 633.61(94)
A new sugar cane variety.
Aust. Sug. J. 1933 : **25** : p. 271.
A new variety O'Mara's 32 which appears to be drought resistant, prolific on poor land, free from disease, ratoons well, strikes freely. It resembles the Uba but has a stalk almost twice as large.

STIMULANTS 633.7

327. TUBBS, F. R. 633.72:575:578.08
A note on the variability of tea seedlings.
Tea Quarterly, Ceylon. 1933 : **6** : 118–20.
A method of estimating the relative importance of heredity and environment as a cause of variability in tea seedlings is being used in comparative tests on a small scale. It is based on the comparison of the variability (*a*) between and (*b*) within pairs of "identical twin" plants artificially obtained by splitting a germinated seed vertically through stem and root so that each half bears one seed leaf.
The possibility of obtaining quadruplet plants in the same way is being investigated.

OIL PLANTS 633.85

328. MUHAMMAD, C. A. 633.85:575.42
Improvement of oilseed crops.
Seasonal Notes Punjab Agric. Dept. 1933 : **11** : No. 1 : 35–37.
A popular article in which the methods of mass and of individual selection are explained, and their relative value for cross-pollinated and self-pollinated crops.
Directions for selection of certain oil seed crops are given and the selection work of the Punjab Agricultural Department is briefly mentioned.

329. 633.85.00.15(54.5)
Research on oilseed crops in the Punjab.
Seasonal Notes Punjab Agric. Dept. 1933 : **11** : No. 2 : 56–57.
The research started in 1929 on toria, sarson, taramira, linseed and til (sesamum) may be summarized as follows :—
Toria (*Brassica Napus* var. *dichotoma*), sarson and taramira (*Eruca sativa*) have been shewn to be extensively cross-pollinated in nature and also highly self-sterile ; though self-compatibility can be induced and pure types isolated, the labour and expense involved would not be justified as the pure types are less vigorous and productive than the natural hybrids. Improvement by a special technique of mass selection has therefore been adopted and the progeny from selected seed has yielded an average of from 1½ to 2 maunds more per acre than unselected seed. Certain selected strains have shewn an 8–10 per cent higher oil content than unimproved seed. A high yielding strain of yellow seeded sarson has proved self-fertile and pure forms can therefore be bred. This type has been crossed with toria and common brown seeded sarson with the object of obtaining self-fertile forms of these two crops.
Some very promising types of linseed and til have been obtained from 57 pure lines of linseed and 35 types of sesamum isolated from mixtures grown in the Punjab.
Germination, growth, flowering and fruiting in the ground-nut have been investigated, and also many high yielding and disease resistant strains have been selected.
Of the castor plant 34 varieties are being studied and the seed of promising varieties is being multiplied.

FRUITS 634

330. 634:581.162.3:016
Pollination of hardy fruits.
J. R. Hort. Soc. 1933 : **58** : 283–84.
Collected bibliographical references.

331. 634.11 Lee's Red Sport
634.75 Delicatessen

Plant registration.
J. N. Z. Inst. Hort. 1933 : 4 : p. 9.

Lee's Red Sport apple arose as a shoot on a tree of the Delicious variety which it resembles, though the sport is all red and also ripens earlier, keeps better and gives a larger crop and is thought by some to be of superior flavour to the Delicious type.
A description is given of the strawberry " Delicatessen " which is of unknown origin but was found among some European seedlings.
The plant is robust and apparently highly resistant to leaf blight, virus etc. Fruiting lasts till midsummer and occurs again in the autumn. The characteristics of the fruit are particularly good and should, with its desirable type of habit, make it a most valuable market variety.

332. 634.11Northern Spy
MACOUN, W. T. 634.11:581.162.5
The Northern Spy apple a parent in breeding.
Cent. Expt. Farm, Ottawa. (Mimeographed).

A full account of the work previously reviewed (Cf. " Plant Breeding Abstracts," Vol. III, Abst. 485).

333. TYDEMAN, H. M. 634.11:575
Breeding experiments with " Paradise " apple rootstocks.
J. Pom. Hort. Sci. 1933 : 11 : 214–36.

During 1930–32 direct and reciprocal crosses of 11 varieties of Paradise apple rootstocks were made and the data on intercompatibility and germination of seed and on the vigour and productivity of the stools, wood growth, girth and " feathering " are discussed.
The differences observed in the seedling families derived from the various combinations of root stocks are regarded on general principles as probably of genetic origin, and an attempt was made to correlate the subsequent performance of these seedling root stocks with some easily identifiable morphological characteristics in the young seedlings but proved unsuccessful.
Though a large number of botanical and other characteristics were observed, clear cut discontinuous segregation could not be detected and some degree of intergrading was present in the great majority of cases. This lack of discontinuous variation is attributed to the polyploid constitution of the apple ; though the fact that all the crosses made had a common parent must have reduced the range of variation which, with other combinations, might possibly reveal more clear cut classes for some of the characters studied.

334. ROSCOE, M. V. 634.11:576.356
The chromosomal constitution of certain cultivated apple varieties.
J. Genet. 1933 : 28 : 157–67.

Observations were made of the pollen mother cell reduction divisions and in certain instances the somatic divisions in some 18 varieties of apples.
In general the strong tendency towards euploidy noted by Nebel was confirmed and it is suggested that triploidy and not aneuploidy is associated with the low germination percentages observed in apples.
The diploid varieties exhibited marked regularity of division whereas meiosis in triploids is characterized by numerous irregularities in chromosome distribution leading ultimately to the production of morphologically and physiologically inferior pollen.
The resemblance between the meiotic behaviour in the triploid apples and the irregularities manifested by triploids of hybrid origin, such as *Betula*, is pointed out, and it is concluded that the unbalanced number and absence of homology in the chromosome units concerned may be the cause of the abnormalities in triploid apple varieties.
Since both diploids and triploids were subject to the same environmental influences, constitutional factors are held to determine chromosome behaviour.

335. 634.11:581.162.5:576.356.5
BRITTAIN, W. H. and EIDT, C. C. 634.11:575.12:581.141
Seed content, seedling production and fruitfulness in apples.
Canad. J. Res. 1933 : 9 : 307–33.

The data presented indicate that seed content is an important factor in fruit setting, for picked apples shewed a consistently larger average seed content than drop apples did.
When crossed with diploid varieties both diploids and triploids, used as female parents, were fruitful, but inferior in fruitfulness when crossed with triploid varieties, though some individual triploid x triploid crosses gave a comparatively high percentage of fruit. The diploid x triploid cross was uniformly unfruitful.
In the fruitful type of cross, whether diploid x diploid or triploid x triploid, a higher average seed content was obtained than in the unfruitful type of cross whether triploid x triploid or diploid x triploid. Also though the triploid x triploid crosses sometimes exceed the diploid x diploid type in fruitfulness, the latter have a higher average seed content.
The results obtained from seedlings were in general agreement with those based on seed only. No definite correlation between seed weight and number of seeds per apple was found in the Gravenstein, King, Wagener and Baldwin varieties, a barely significant correlation was found in Spy.
The relation between " one-sided " fruit, open calyx-end and " moldy-core " and seed content was examined and in Gravenstein the last two abnormalities were apparently associated with imperfect pollination and low seed content, but further investigation of the question is necessary. Data not included in the present paper indicated that whereas the male parent has no appreciable effect on germination, when used as females, triploids as a group shew a much lower germination than diploids.

336. WET, A. F. de 634.13(68)
'n lys van peer-variëteite wat in die Unie van Suid–Afrika gekweek word, en hul sinonieme. (**A list of pear varieties in cultivation in the Union of South Africa, and their synonyms.**)
Sci. Bull. Pretoria 1931 : No. 101 : Pp. 40.

A list intended for the use of agricultural colleges in testing new varieties and also for farmers when buying new trees, or marketing or exhibiting their fruit. The information given should also help to prevent economic losses to nurserymen and farmers due to the importation of old or even out of date or otherwise undesirable varieties under new synonyms.
The survey contains varieties in the Union in 1928.

337. 634.574:581.162.3
Artificial fertilization of *Pistacia Vera.*
Cyprus Agric. J. 1933 : **28** : 90–91.

Owing to the dichogamy existing in *P. vera* a few twigs from early and late flowering male trees should be grafted on each female tree every year in order to ensure simultaneous flowering of the sexes. Artificial fertilization, the technique of which is described, should also be employed.
P. vera can be grafted on *P. Terebinthus* and *P. lentiscus.*

338. 634.58:575.11
HAYES, T. R. 634.58
The classification of groundnut varieties. With a preliminary note on the inheritance of some characters.
Trop. Agriculture 1933 : **10** : 318–27.

In order to determine in the groundnut, *Arachis hypogea*, a number of definite characters for a genetic analysis of the plant, a botanical study of the numerous varieties was made. The grades of each of 15 characters have been used as a basis of the varietal classification given in the present paper.
From the F_2 generation of a Valencia x Sine cross, it was concluded that the first of each of the following pairs of characters was dominant, the first two pairs shewing a monohybrid ratio,

and the second two pairs a dihybrid ratio : Red brown testa *v.* light brown testa, much red colour on stem *v.* slight red colour on stem, runner habit *v.* bunch habit, long seed *v.* short seed, flowers fading early *v.* flowers fading late, deep coloured corolla *v.* light coloured corolla, red colour on leaflet vein *v.* absence, Sine leaf shape *v.* Valencia leaf shape.
Complementary factors appeared to underlie the character pairs, fertile *v.* sterile, normal *v.* crinkled leaf, and presence *v.* absence of rachis, and the first named character of each pair was dominant.
The following 8 characters were correlated with each other and related to yield : length of leaves, of petiole, of rachis, of sheath, width of leaves, corolla colour, hairs on petiole and number of seeds. The relation between number of seeds and hairs on the petiole may be of use in selecting or breeding for high yielding qualities.
A search for a type immune to Rosette disease gave inconclusive results.

339. 634.771
The Giant Plantain.
J. Jamaica Agric. Soc. 1933 : **37** : 481–82.
Further correspondence giving views on the Giant Plantain, its identification and nomenclature.

340. 634.771
634.771(72.98)
Plantains.
Proc. Agric. Soc. Trin. Tob. 1933 : **33** : 245–46.
Remarks on the identity of the Giant and French plantains which apparently resemble each other and also the " Black " plantain. The question of the survival of a " striped " or " variegated " variety in Trinidad is also raised.

341. THOMPSON, J. M. 634.771:581.162.5
Studies in advancing sterility. Part VI. The theory of Scitaminean flowering (with special reference to the racemose origin of certain forms of cymose inflorescence, and the acarpous nature of certain types of inferior ovary).
Pub. Hartley Bot. Lab. 1933 : No. 11 : Pp. 114.
Among other plants, the morphology of the inflorescence of species of *Musa* is described and illustrated.

VEGETABLES 635

342. BHADURI, P. N. 635.64:581.331:576.3
A note on the " new type of fertilization " in plants.
Current Sci. Mysore 1933 : **2** : 95–96.
Confirmation in the tomato of the occurrence of diploid tissue in the unfertilized chalazal portion of the endosperm nucleus, as a result of premature division of the primary endosperm nucleus before the male gamete is discharged from the pollen tube.

343. WYNNE SAYER, M. 635.655(54.1)
Soybean (*Glycine hispida* Maxim.).
Agric. and Live-st. Ind. 1933 : **3** : 470–74.
A short account of the soya bean, its uses, cultivation and the varieties grown at Pusa.

344. RAMANATHA AYYAR, V. and BALASUBRAHMANYAN, R. 635.657:581.162.5
Occurrence of sterile plants in Bengal gram (*Cicer arietinum.*)
Madras Agric. J. 1933 : **21** : 392–93.
At Coimbatore Cotton Breeding Station sterile plants without pods occurred with increasing frequency in progenies of single plant selections. The various abnormalities accompanying the sterility are described.

Part II. Foreign.

STATISTICS 519

519.251.9

345. BRYAN, A. A. 633.15-1.421
Factors affecting experimental error in field plot tests with corn.
Res. Bull. Iowa Agric. Expt. Sta. 1933 : No. 163 : 243-280.

The data for three uniform planting experiments on three varieties in two different years, and on different areas, are presented to shew the variability existing among the yields of 2,304 hills of yellow dent corn. The method was to put in dummy varieties, and by means of the analysis of variance to eliminate the variability between blocks of plots, considering then the change in variability with changing size and shape of plot. Crosses of inbred lines were less variable than open-pollinated varieties. The decrease in variability with increase in plot size was not proportional to the size, and it is concluded that the error for a given area would be lower with larger numbers of smaller plots. Long and narrow plots had a larger error than plots of the same size more nearly square. Replicated experiments, and the technique of analysis of variance, are held to be most efficient when only a few items are being compared. In general the tendency was towards the greater efficiency of the smaller plot.

346. LIVERMORE, J. R. and NEELY, W. 519.251.9
The determination of the number of samples necessary to measure differences with varying degrees of precision.
J. Amer. Soc. Agron. 1933 : **25** : 573-77.

The purpose of this paper is to present certain tables designed to facilitate the making of significance tests by the usual probable error formulae.

347. PRZYBOROWSKI, J. 519.251.9
O metodzie wykorzystania dawniejszych analiz laboratoryjnych w celu dokladniejszego wyznaczenia średniego błędu średniej arytmetycznej nielicznej serji równoległych analiz. (**On the method of estimating the standard error of a mean of a small series of routine analysis data, using the results of analysis made previously.**)
Rocz. Nauk Rol. 1933 : **30** : 303–32.

Stress is laid on the need in agricultural research for exact tests of significance, particularly where the sample of data is small, and these are described. In problems of routine analysis continuous experiments are being made, but each is based on only a small number of repetitions, and the difficulty of determining the error is got over by building up a good estimate from a number of experiments. This can be done provided the accuracy of the analysis remains reasonably constant, so that the experiments are under statistical control. An example is given of the accuracy of determination of glume percentage in oats over six years, where control was established after the first three years, and the normality of the subsequent data was demonstrated.

GENETICS 575

348. FRATEUR, J. L. 575
Caractères nouveaux des animaux domestiques et des plantes cultivées. (**New characters of domestic animals and cultivated plants.**)
Bull. Agric. and Hort. Bruxelles 1933 : No. 1 : 124–61.

An outline of the principles of genetics with remarks on heredity, variation and hybridization, and the practical aspects of genetic analysis and breeding.

349. LIEPIN, T. 575(47)
Genetics in U.S.S.R.
Lenin. Acad. Agric. Sci., Inst. Pl. Ind., Leningrad 1932 : Pp. 14.

This account of genetical work both on plants and animals in Russia shews the immense progress made in the subject during the last 16 years.

The work of the main centres for genetical research is described, the names of the principal workers are given and the work on which they are engaged is briefly summarized.

350. 575.061.1
SEIFRIZ, W. 634.97:575.061.1
More about the spiral habit.
Science 1933 : **78** : 361–63.
A consideration of the spiral habit among numerous organisms leads the author to conclude that the "spiral habit whether in trees, snails or chromosomes, is a fundamental heritable protoplasmic quality."

351. PRINGSHEIM, E. G. and SCHWARZ, W. 575.061.633
Das Auftreten weissbunter (panaschierter) Pflanzen in der Natur. [**The occurrence of white spotting (variegation) in wild plants.**]
(Festschrift zum Siebzigsten Geburtstage von George Karsten.)
Flora, Jena 1933 : **128** : 111-22.
Finds of variegated plants to the number of 50 discovered by the authors in the regions round Darmstadt and Prague shewed that variegation in nature is frequent in many localities and occurs in the most varied plant associations, though at random.
In many species, e.g. *Trifolium pratense* and *Rumex arifolius*, the phenomenon was so frequent that all specimens could not be included, whereas variegation was extremely rare in *Polygonum Convolvulus*, only one specimen being found after a search lasting some weeks.
Though inclining to the view that mutation is the causal factor in variegation, the authors doubt the theory of the contributory influence of cultivation.
Future observations should elucidate the question of the possibility of a genetic basis for spotting and the possible effect of external conditions on its expression.
There were some indications that white spotting was correlated with chlorosis.
The various forms of variegation, e.g. sectorial, speckled, intermediate, and periclinal types and the distribution of the sectorial and periclinal chimaeras among the various species and genera found are discussed.
So far variegation has been found in the gymnosperms, the angiosperms and the vascular cryptogams but not in the bryophytes.

352. HAAN, H. de 575.1
Die Symbolisierung der Gene, II. (**The nomenclature of genetic factors.**)
Genetica 1933 : **15** : 219–24.
A further plea for the regulation of genetic nomenclature, (see Plant Breeding Abstracts, Vol. III Abs. 23) in which it is suggested that once an international congress, appointed to consider the question, has drawn up the general rules of nomenclature, it should proceed to determine the proper use of symbols in the genetic investigation of individual organisms. The chaos prevailing at present is clearly exemplified from the symbols at present employed by various eminent workers on the genetics of the rabbit.

353. 575.1(44)
Jacques de Vilmorin.
Sélectionneur 1933 : **2** : 5–11.
Obituary notice and list of publications.

354. CHRISTIANSEN-WENIGER, F. 575.1:578.08
Das "Leica"-Kleinbildverfahren im Dienste des Züchters. (**The "Leica" miniature photographic process as an aid to the plant breeder.**)
Züchter 1933 : **5** : 213–16.
The advantages of the miniature image camera, and especially the Leica make, and its convenience and suitability as an aid in plant breeding work are described in detail.
Inter alia it is claimed that enlargements from small photographs taken by this process are sharp and clear in detail. Pictures can be taken by artificial light, while by means of a special attachment stereoscopic photographs can be obtained.

355. 575.12:575.24
633.14:575.24
633.84:575.24
KOSTOFF, D. 633.71:575.127.2:575.24
Hybrid mutations.
Amer. Nat. 1933 : **67** : 560–63.
A preliminary note on two groups of " instances indicating hybrid mutations," i.e. gene mutation following hybridization.
The first group comprises cases of plants with recessive genes in the homozygous state appearing in the F_2 derived from two grand-parents that were homozygous for the corresponding dominant allelomorphs. The examples cited are (a) a cross of the *dolma* and *kamby* varieties of red pepper, which gave 1.37 per cent F_2 offspring with orange peppers when ripe ; and (b) the appearance of a few chlorophyll albinos in the F_2 generations from two *Secale cereale* x *S. montanum* hybrids that were homozygous for the presence of normal chlorophyll.
The second group of hybrid mutations is represented by instances of polymorphic trigenomal *Nicotiana* interspecific hybrids produced from the following combinations of homozygous pure species :— (a) *Nicotiana glauca* (n =12) x *N. Langsdorfii* (n = 9) backcrossed to *N. Langsdorfii* ; (b) (*N. tabacum* (n = 24) x *N. tomentosa* (n = 12))x *N. Rusbyi* (n = 12) ; (c) *N. tabacum* x (*N. sylvestris* x *N. Rusbyi*) and (d) (*N. tabacum* x *N. tomentosa*) x *N. tomentosa.*
More detailed data and further information will be published later.

356. HOLMES, S. J. 575.17:575.116.1
Are genes the project of crossing-over ?
Science 1933 : **78** : 309–11.
Speculations on the structure, propagation and ultimate nature and origin of the gene.

CYTOLOGY 576.3

357. BABCOCK, E. B. 576.3
John Belling. Pioneer in the study of cell mechanics.
J. Hered. 1933 : **24** : 297–300.
An obituary dealing with the life and work of John Belling.

358. BLEIER, H. 576.354.4:576.356.52
Die Meiosis von Haplodiplonten. (**Meiosis in haplo-diplonts.**)
Genetica 1933 : **15** : 129-76.
A detailed study of meiosis in two haplo-diplont forms of *Oenothera* shewed that in haplo-diplonts, sex cells with the full chromosome genom (haploid, diploid and tetraploid) may occur in nine different ways. Among the more important general theoretical considerations discussed are : chromosome conjugation as the fundamental difference from the standpoint of cell mechanics, between meiosis and mitosis ; pre- and post-reduction in animals and plants including *Datura*, *Nicotiana* and *Solanum* forms.
There is a bibliography of 77 references to recent literature.

BOTANY 581

359. GESCHER, N. von 581.143.26.03
Vernalization : a new method of shortening the vegetative period of plants.
Int. Rev. Agric. Rome 1933 : **24** : 410–16.
An explanatory article on the Russian results (Cf. " Plant Breeding Abstracts " Vol. III, Abst. 554) and an outline of control experiments now in progress in other countries.
A list of recent literature on the subject is appended.

360. 631.524.2:551.566.3

(Problems of northern agriculture No. 2.)

Lenin. Acad. Agric. Sci., Inst. Pl. Ind. Leningrad 1933 : Pp. 124.

An account of the experiments carried out in the Kola Peninsula and the Loukh bogs on large varietal collections of a number of crops to test the suitability of the respective varieties for cultivation in the extreme north.

The fact that very many varieties failed and only odd ones were successful illustrates the necessity for using widely representative collections in such work.

PLANT DISEASES 632

361. HOLTON, C. S. 632.451.2:575.11:576.3

Studies in the genetics and the cytology of *Ustilago avenae* and *Ustilago levis*.

Tech. Bull. Minn. Agric. Expt. Sta. 1932 : No. 87 : Pp. 34.

Two sex groups were determined in *U. avenae* and *U. levis* by isolating primary sporidia from the promycelia of germinating chlamydospores and crossing them in all possible combinations. Reduction of sex occurs either in the first or in the second meiotic division. Fusion between the sporidia of both species was observed and is described in detail, one sporidium being definitely active and the other passive. Observations on the differences in the type of growth of sporidial lines of opposite sex shewed that these differences cannot be regarded as sufficiently reliable for the determination of sexually compatible monosporidial lines in these fungi.

Perfect interfertility was found between *U. avenae* and *U. levis* and chlamydospores were found on plants of Anthony oats inoculated with intra and interspecific crosses. Oat seedlings were inoculated with intra and interspecific crosses of the two fungi and grown in the field. The fifteen plants inoculated with crosses within *U. levis* shewed only the covered type of smutted panicle. Of the four plants inoculated with crosses within *U. avenae*, two shewed the loose type, one the covered type and in one plant both types were present.

The chlamydospores of all the crosses with *U. levis* were smooth and those of all the crosses with *U. avenae* were echinulate. The twelve interspecific crosses produced both the covered and loose type of smut and intermediate types. Experiments shewed that varietal reaction does not determine the type of smut.

Tests of the viability of the chlamydospores from interspecific crosses shewed that although there was normal germination only very few of the primary sporidia could be grown and the presence of lethal factors is suggested.

In the case of the cross between two monosporidial lines which originated from interspecific hybrid chlamydospores the smut was buff coloured instead of black. The chlamydospores were smooth and hyaline though in their life cycle they behaved exactly as those of *U. avenae* and *U. levis* and the author considers that the buff type should be regarded as a variety of *U. levis*. None of the hybrid sporidia would grow in culture and it is considered unlikely that this type occurs in nature.

Segregation for spore colour and spore markings was studied in crosses between monosporidial lines of the buff organism and of *U. avenae* and *U. levis*. Echinulation was dominant to smoothness and brown to hyaline, the latter in a 3 : 1 ratio.

Sectors which produced cultural variants were observed but as each of these was culturally identical with other lines it is suggested that they are the result of delayed segregation rather than of mutation.

A cytological investigation of the two species shewed that the sporidia are uninucleate as are also the promycelial cells, the primary sporidia and the mycelium of monosporidial cultures. Unsuccessful attempts were made to stain fusing sporidia.

362. 632.451.2:575.24

STAKMAN, E. C., TYLER, L. J. and HAFSTAD, G. E. 633.15–2.451.2:575.24

The constancy of cultural characters and pathogenicity in variant lines of *Ustilago zeae*.

Bull. Torrey Bot. Cl. 1933 : **60** : 565–72.

A study has been made of a large number of distinct lines arising in colonies of a single

monosporidial unisexual line of *Ustilago zeae* and its variant derivatives.
From the rate of occurrence of sectoring, from differences observed in regard to sex and pathogeneity and from evidence of undiminished virulence of the variants, it is concluded that a large number of biotypes may arise from a single unisexual monosporidial line by what appears to be mutation.
Since the pathogeneity of such individual biotypes may differ, evidently chlamydospore collections of so-called biological forms of smut fungi may comprise a very large number of biotypes.

363. MELCHERS, L. E. 632.451.2:576.16:633.17
Physiologic specialization of *Sphacelotheca cruenta* (Kühn) Potter.
J. Agric. Res. 1933 : **47** : 339–42.
Smut reaction tests were made with 35 varieties of sorghum and two distinct forms of *Sphacelotheca cruenta* were discovered, one obtained from India being designated form 1 and one from Manhattan form 2.
Certain of the feteritas, milo, hegari, Schrock and Dwarf Shantung kaoliang are resistant to both forms. Form 1 readily attacks kafir x feterita and Pierce kaferita but form 2 does not to any great extent. On the other hand form 2 attacks Red Amber x feterita and White Yolo heavily whilst these varieties are immune to form 1.
Apparently certain varieties of feterita and milo generally regarded as immune may be attacked by one or both forms of *S. cruenta*.
Certain varieties of sorghum may be used to differentiate the two physiological forms. It is possible that additional forms might be detected by using a larger range of sorghums.

364. WANG, D. T. 632.451.2:581.162.4
Observations cytologiques sur l'*Ustilago hordei* (Pers.) Kell. et Sw. **[Cytological observations on *Ustilago hordei* (Pers.) Kell. et Sw.]**
C.R. Acad. Sci. Paris 1932 : **195** : p. 1041.
Nuclear behaviour, reduction and fusion are described.

365. FLOR, H. H. 632.451.3:576.16
Studies on physiologic specialization in *Tilletia tritici* and *T. levis* in the Pacific Northwest.
J. Agric. Res. 1933 : **47** : 193–213.
The prevalence and distribution of *T. tritici* and *T. levis* and of their physiological forms in the Pacific Northwest, the constancy or otherwise of the pathogeneity of the various forms, and the correlation between the morphological and cultural characteristics and pathogeneity of the physiological forms were investigated.

ECONOMIC PLANTS 633

366. AKEMINE, M. 633
(Kind of crop plants under cultivation in the world.)
Agric. and Hort. (Japan) 1933 : **8** : (8–10) : 1825–38.
A tabulated enumeration of the cultivated plants of the world with data on the number of families and species and the proportion of food and forage crops, etc. Forest trees are not included.

367. KIRK, L. E. 633:575:578.081
The progeny test and methods of breeding appropriate to certain species of crop plants.
Amer. Nat. 1933 : **67** : 515–31.
The main part of this paper is devoted to a consideration of the breeding methods most suitable to herbage plants.
The relative merits of selfed line breeding, strain building and mass selection are considered

with special reference to their applicability to the different species and their problems. The particular difficulties arising in the inbreeding of potatoes are outlined.
Progeny tests are the only reliable means of evaluating the breeding potentialities of parent plants. It is most important that progenies should be tested in environmental conditions similar to those in which the variety is presumably to be grown.

368. 633:575.42(92.2)
633.682:575.42
634.58–2–1.521.6
Het Landbouwkundig Institut. Inwijding van het nieuwe kantoorgebouw. (**The Agricultural Institute. Inauguration of the new office buildings.**)
Landbouw, Buitenzorg. 1933 : **9** : 287–95.
At the opening of new buildings at the Agricultural Institute at Buitenzorg the following achievements of the Institute were briefly mentioned, in addition to the work of plant improvement and propagation of high quality seed and plant material.
Among the successful Brazilian varieties of cassava introduced and isolated by selection were Sao Pedro Preto [? Petro] and its seedlings and also Basiorao, Tapicuru and the edible forms of Mangi and Valença.
The selection of peanuts resulted in the production of the line Schwarz No. 21 which is superior to the local varieties both in yield and resistance to slime sickness.

369. ROEMER, T. 633–2.4–1.521.6:575
Immunitätszüchtung. Eine zusammenfassende Darstellung 14 jähriger Arbeiten aus dem Gebiete der Biologie. (**Breeding for immunity. A survey of 14 years of biological research.**)
(Festschrift zum Siebzigsten Geburtstage von George Karsten.)
Flora, Jena 1933 : **128** : 145-96.
In this report on the work of the Institute f. Pflanzenbau, Halle, the economic and scientific aims in breeding for immunity are defined, and the necessity for artificial and natural infection as complementary methods and the question of technique are fully discussed and exemplified from the work of various investigators.
Research on physiological races and the use of test collections of the varieties of cultivated plants is described and the necessity of uniformity in the varieties used and the method of indicating results is emphasized. The difficulty of the whole problem of biological races is fully discussed.
The results obtained on the following aspects of immunity are surveyed :— (1) disease resistance in various cereals and its genetic basis ; (2) the physiological races of various pathogens and the artificial production of new biotypes ; (3) the production of homozygous resistant plants in F_2 by combining Nilsson-Ehle's method of obtaining homozygous lines with yearly artificial infection tests ; (4) the selective action of the host on the fungus population and the latent effect of the fungus on the host, which may be definitely injured though actually exhibiting none of the typical signs of disease ; (5) the production of new resistant varieties.
The results achieved up to the present by the Institute in breeding immune forms of wheat, barley, oats, *Phaseolus* and *Pisum* are outlined.
A bibliography of 30 references is appended, many of which have been reviewed in " Plant Breeding Abstracts."

CEREALS 633.1

370. TULAIKOV, N. M. 633.1(47)
(**The Institute of Grain Industry and its work in 1931.**)
Ogiz, Saratov 1932 : Pp. 32.
A general survey of the organization and problems of the institute.

371. BRUNINI, V. C. 633.1:575(46)
Informe anual de los trabajos realizados y los resultados obtenidos durante el año agrícola 1932–33. (**Annual report of the work and results obtained in 1932-33.**)
Bol. Chacra Exptl. " La Previsión " 1932–33 : **1** (4) : 3–39.

The results of comparative tests of the most widely distributed varieties of wheat and the best and most promising local and imported hybrids at different times of sowing, are described and tabulated ; yield, type of grain and baking quality, attack by rust, yield of green plant and time of maturity are given. The best yields were always given by new hybrids, especially from the crosses (B x R–C) x San Martin, Lin-Calel x Ardito and P. de Gales x 38. Certain North American hybrids were also outstanding. Many of the highest yielding hybrids were also possessed of excellent baking quality. The locally produced wheats were resistant to *Puccinia triticina*, the newer ones also to *P. glumarum* ; all were attacked, though lightly, by *P. graminis*. The best all-round results were given by La Previsión 25, Kanhard and Blackhull. The reaction to bunt (*Tilletia*) was also tested, the only well-known variety which was resistant being Kanred ; the new *durum* Candeal is however still more resistant. Some of the descendants of Kanred were also equal to it in resistance. There were indications that the parasite was more virulent when cultured on the variety whose reaction was to be tested.

The same wheats were tested at a number of other stations in different parts of the country ; here again La Previsión 25, and also La Previsión 3, gave outstanding results.

Similar observations were made on oat varieties and hybrids, yield in relation to time of sowing, the best time of sowing and the suitability of the varieties for grazing, were studied, together with the reaction to *Puccinia coronifera*. One of the new hybrids of the yellow type, La Previsión 7, exceeded the common yellow in yield by 10 per cent, another La Previsión 13, exceeds the common oats in hectolitre weight and its yield is unaffected by change in time of sowing and by grazing.

Barley tests on the same lines shewed the local selections, all of the Chevallier type, to be superior in yield to other imported varieties by 25 per cent.

Flax varieties and hybrids were examined for yield, resistance to *Melampsora lini* ; Klein 10 was immune and yielded well in consequence. The influence of time of sowing and of grazing was also examined ; a retardation of up to 15 days could be obtained by grazing.

Experiments on maize, sugar beet and sunflower are also in progress.

372. KATAYAMA, Y. 633.1:575.127:581.162.5
Crossing experiments in certain cereals with special reference to different compatibility between the reciprocal crosses.
Mem. Coll. Agric. Kyoto. 1933 : No. 27 : Pp. 75.

The material used consisted of numerous species of *Aegilops*, *Triticum*, two forms of *Aegilotricum fertilis*, *Secale cereale* L., *Avena sativa* L., *Hordeum hexastichum* L. and *Oryza sativa* L. Certain observations subsidiary to the main problem are recorded. Generic differences (and within the *Aegilops* group specific differences too) were found in the duration of the receptive capacity in emasculated flowers.

Crosses with mixed pollen of *Ae. ventricosa* and *T. durum* shewed that the former often failed to fertilize the *durum* ovules, but that both *ventricosa* and *durum* pollen seemed to fertilize *ventricosa* ovules. This difference was subsequently shewn to be due to the relatively low germination capacity of *ventricosa* pollen on *durum* stigmata.

Observations on the development of embryo and endosperm in reciprocal crosses between *Ae. ventricosa* and *T. durum* shewed that when *T. durum* was used as the ♀ seed formation was low but the grain well developed and germination good, whereas in the reciprocal cross seed is readily formed but the grain usually shrivelled later and germination was bad. The differences in the set of seed are mostly due to fertilization difficulties and germination is affected by the degree of development and differentiation of the embryo and endosperm.

The *Aegilops* interspecific crosses were generally difficult, tetraploids crossed easily, diploid x hexaploid crosses were rarely successful. In spite of considerable variation, it may be said that in general the differences in percentage set of seed and germination were related to the direction

of the cross and also that no definite relationship with the chromosome numbers of the parents could be established for the whole series of crosses, the relation varying with the species used. A corresponding result was obtained in the intergeneric cross *Aegilops* x *Triticum*.
The *Triticum* species in general crossed readily giving good seed development and germination. F_1 seeds were also easily obtained when a plant with a high chromosome number was used as the ♂, but the germination in such cases was low. Where the parental chromosome numbers were equal the reciprocals shewed no great difference.
In *Aegilotricum* differences in set and germination from the reciprocal crosses were probably due to parental differences in fertility and germination capacity.
Of the intergeneric combinations the *Aegilops* x *Triticum* crosses were obtained with difficulty and shewed considerable variation in the reciprocals but in the author's own experiments hybrids were readily obtained where *Aegilops* was used as the ♀ parent. No definite consistant relationship could be found between the parental chromosome numbers and the difficulty in the setting of seed. Combinations of *Aegilops* ♀ x *Aegilotricum* ♂ were easily obtained but gave seeds which did not germinate, whereas the reciprocal set seed with difficulty but a few germinated.
Triticum x *Aegilotricum* crosses set seed easily when *Triticum* species with a higher number of chromosomes e.g. *T. vulgare* were used.
In general the results shewed that no definite correlation exists between percentage of grain and percentage germination, these two being due to independent causes.
Further consideration of the chromosome numbers shewed that the qualitative difference between the parental chromosomes has more effect upon the set of grain than have the actual chromosome numbers ; whereas the numerical relation of the chromosomes in F_1 seeds, bears a close relation to germination capacity. These same two relationships were also deduced from a consideration of the phylogenetic aspects of compatibility differences in reciprocal crosses.
From the embryological standpoint the two main causes of the differences in set of grain and germination in reciprocals proved to be :—difficulties in fertilization, including pollen germination and pollen tube growth, compatibility of the parental nuclei and zygotic sterility i.e. failure of development of embryo or endosperm or of both.
The effects of quantitative and qualitative disturbances of the relation between the parental genoms in the pollen tube, style, embryo and endosperm tissues upon reciprocal crosses are considered ; and the quantitative and qualitative relations between the genoms of embryo and endosperm are shewn to be of particular importance.
The development of the embryos depends on the condition of the endosperm, on the quantitative and qualitative differences between the genoms of the egg and of the male nuclei and also on the cytoplasmic condition of the egg. The relation many also sometimes affect the compatibility of the parental nuclei and embryonic development, e.g. in high numbered ♀ x low numbered ♂ combinations.
In considering the phylogenetic aspects of reciprocal crossing the view is accepted that structural changes in the chromosome may alter the usual physiological effects of the gene complex. A scheme shewing the phylogenetic differentiation between genoms in polyploid species is outlined and it is concluded that setting of grain and germination are closely related to the phylogenetic differentiation of the genom and that reciprocal crosses will exhibit various gradations in the differences in respect of these two functions.
A bibliography of five pages concludes the paper.

373. 633.1:581.142
DEMING, G. W. and ROBERTSON, D. W. 633.11:581.142:575.11
Dormancy in small-grain seeds.
Tech. Bull. Col. Expt. Sta. 1933 : No. 5 : Pp. 12.
In a varietal study of dormancy a preliminary genetical test based on the behaviour of an F_1 hybrid from Marquis x Federation suggested that dormancy may be inherited and may perhaps be dominant over absence of dormancy.
Further investigations are needed.

374. DIEHL, R. 633.1–2.111–1.521.6:575
La sélection de céréales d'hiver résistantes au froid. (**The selection of winter cereals resistant to cold.**)
Sélectionneur 1933 : **2** : 30–40.
The selection of cold resistant winter cereals is discussed under the following heads for the benefit of French plant breeders :—
(1) Selection of indigenous varieties, (2) introduction of foreign varieties and (3) improvement by crossing.
A table of varieties resistant to cold is included.

375. SCHMIDT, E. W. and FEISTRITZER, W. 633.1–2.4
Beiträge zur Fusskrankheit des Getreides und ihrer Bekämpfung. (**Contribution on foot rot of cereals and its prevention.**)
Arch. Pflanzenbau 1933 : **10** : 391–421.
A valuable general review in which, among other points, the effects of varietal differences in the time of ripening upon the occurrence of disease are considered.

WHEAT 633.11

376. 633.11 Préparateur Étienne
Le blé G.4 ou Préparateur Étienne dans le Centre-Ouest de la France. (**The variety of wheat G.4 or Preparateur Étienne, in the Central Western region of France.**)
C.R. Acad. Agric. Fr. 1933 : **19** : 846–48.
A new white-grained, early wheat from a cross of the two hybrids Hâtif Inversable and (Riéti x Squarehead). It is highly resistant to heat injury and to rusts, is of satisfactory baking quality, and in the Département de la Charente has given a superior yield to Bon Fermier. Further information from other districts is being collected.

377. HUDSON, P. S. 633.11(42)
English wheat varieties. I Classification.
Z. Züchtung 1933 : A **18** : 505–25.
The first part of this paper, after a short summary of the history of the subject up to the time of Shirreff (1873), introduces a classification for English varieties of wheat, based, in view of their similarity, on the finer points of structure and seedling characters, the details of which are best studied during development.
A number of individual varieties is also described.

378. PISSAREV, V. 633.11:575
Ökologische Klassifizierung des Ausgangsmaterials bei pflanzenzüchterischen Arbeiten. (**Ecological classification of the material used as a starting point for plant breeding work.**)
Z. Züchtung 1933 : A **18** : 437–46.
The old, analytical methods of selection have yielded results only with difficulty and further progress must be looked for from the newer methods of synthetical selection, by which plants having the desired characters are crossed together and a combination is hoped for among the progeny. To achieve the best results it is essential that the parent forms should be carefully chosen and with this aim in view the Institute of Plant Breeding in the U.S.S.R. has made a collection of 28,000 samples of wheat alone from all parts of the world and classified them on an ecological basis into 300 types.
These types have been distributed among the 30 largest experimental stations of the Union where their behaviour is studied under various climatic conditions.
From these collections may be selected the parents for the type desired.
The geographical distribution of some of the most important types for the plant breeder is briefly indicated, e.g. straw stiffness is typical of winter wheats of north western and central Europe and parts of Central Asia, of the spring wheats of India, among the varieties bred in Australia

and the indigenous races of Mongolia ; high yields may be found among the wheats of Sweden, England, Germany and the indigenous but dwarf wheats of Afghanistan.
Many of the best wheats of to-day have been produced by crosses between wheats from very different countries ; and by the synthetical method organized on the scale described it is hoped increase enormously the area and the cultural value of wheat in the U.S.S.R.

379. SCHRIBAUX, E. 633.11:575(44)
Orientation à donner au perfectionnement des blés. (**What should be done in wheat improvement.**)
Sélectionneur 1933 : **2** : 13–31.
Some general considerations based on the belief that good indigenous French wheats can be successfully bred for disease and cold resistance and baking quality. A list of suggested parent varieties and some isolated breeding data are given. Centralization of research and of the interpretation of results, if combined with an extension of the local experiment centres, should lead to better co-ordination in breeding the desired wheat types.

380. 633.11:575.127
633.11 Aegilops :575.127
MORITZ, O. 633.14:575.127
Serologische Untersuchungen an Getreidebastarden. (**Serological investigations of cereal hybrids.**)
Ber. deuts. bot. Ges. 1933 : **51** : (52)–(57).
Using *Triticum dicoccoides* x *Aegilops ovata* and wheat x rye hybrids from two sources and also the 3 corresponding pairs of parent forms, an attempt was made to demonstrate by the serological protein reactions of the seed albumen the hybrid nature of the plants from the three crosses.
Success is claimed in the case of *Triticale* (i.e. *Triticum* x *Secale*) which (according to a communication to the author) has also previously given evidence of its hybrid character by the fact that it is susceptible to *Puccinia dispersa*.
The *T. dicoccoides* x *Ae. ovata* cross proved to be not entirely suitable material for the test owing to the very considerable resemblances in the protein reactions of their seed ; hence the investigation of other bybrids from parant forms capable of being clearly differentiated is regarded as desirable.
Further work with the seed protein of the green plant is contemplated with *Raphano-Brassica* and *Galeopsis*.

381. RUBNER, A. 633.11:575.127.2:581.46:575.11
Über die Vererbung von Ähreneigenschaften bei Kreuzungen zwischen tetraploiden Wild- und hexaploiden Kulturweizen. (**On the inheritance of ear characters in crosses between tetraploid wild and hexaploid cultivated wheats.**)
Z. Züchtung 1933 : A **18** : 447–504.
These investigations are the continuation of work begun by Raum and published in 1931 (see " Plant Breeding Abstracts " Vol. I, Abst. 505).
The characters studied are average fertility, average density, glume closure and brittleness of the rachis and awning and the aims of the experiments was to determine from a study of the segregation of the hybrids whether these characters were present in the bivalents of the emmer, and *vulgare* wheats or in the univalents of the *vulgare* wheats.
Raum's investigations were made on the F_1 and F_2, the author used the same crosses, with one addition, and carried the work on into F_3.
The crosses were :—*T. dicoccoides spontaneonigrum* x *T. Spelta* and *T. vulgare erythrospermum* ; *T. dicoccoides fulvovillosum* x *T. Spelta* and *T. vulgare erythrospermum*.
Fertility was calculated on the basis of the percentage of plants with 81–100 per cent. of fertile spikelets and the results shewed a higher fertility of the crosses with *T. dicoccoides spontaneonigrum* than those with *T. fulvovillosum*, which suggests a closer relationship between the former 14 chromosome wheat and the *vulgare* group.
The data on the average density confirmed Raum's results that the factors for average density

are located in the 14 homologous chromosomes of the emmer and *vulgare* groups and not in the univalent *vulgare* chromosomes ; and that four factors determine the density of the hybrids. The author was also able to confirm Raum's conclusions that the spelt gene S in the homozygous condition, when combined with the length factor B, is able to cause a lengthening of the rachis internodes. In the heterozygous condition on the other hand the effect is very different and without any regularity.
From the results of the segregation for brittleness of the rachis and glume closure it may in general be stated that if the two characters are not exhibited it is due to the presence of an inhibiting factor which is in either the bivalent or univalent chromosomes or in both. This inhibiting factor may also modify the effect of the S factor and B, the factor for length of rachis internodes.
Presence of awns is found to be determined by two factors for awns but with these are associated an inhibiting and a liberating factor and these are present in the bivalents of the *vulgare* varieties used. The distribution is as follows : one factor for awns (F) is present in *dicoccoides*, the other (G) in *vulgare* ; the spelt wheats have no factors for awns ; *dicoccoides* possesses the inhibiting factor H ; the liberating factor is always present in the *vulgare* group. The *vulgare* group, besides the liberating factor (I), has also the inhibiting factor which, however, in the crosses concerned is only present in the spelt wheats.

382. Oehler, E. 633.11:575.127.5:633.11 *Aegilops*
Untersuchungen über Ansatzverhältnisse, Morphologie und Fertilität bei *Aegilops*-Weizenbastarden. II. Teil. Die F_2' und F_3'-Generation. **(Investigations on the set of seed, morphology and fertility in *Aegilops*-wheat hybrids. II. The F_2' and F_3' generations.)**
Z. indukt. Abstamm.- u. VererbLehre. 1933 : **66** : 49–92.
The investigation, the results of which have already been published (cf. " Plant Breeding Abstracts " Vol. III, Abst. 623), is here continued in the F_2' and F_3' backcross generations. Besides the progeny of the F_1's previously described, the hybrids of a certain number of other crosses were included in this investigation. In all, during the four years, 712 F_2' and 3,639 F_3' plants were examined.
Three types, wheat-like, *Aegilops*-like and intermediate could be distinguished among the F_2' and F_3' progenies for the following vegetative characters : growth habit, culm length and thickness, colour of the nodes ; pubescence of the leaf sheath ; auricle shape ; leaf shape, and pubescence of the lamina, margins and auricle, waxy covering of the leaf sheath, lamina and culms.
The greater number of the F_2' plants were intermediate but there was an increase in the proportion of the wheat-like plants in F_3'. There was correlation between growth habit and tillering, culm length, culm thickness (weak), pubescence of the leaf sheath, leaf shape and pubescence of the leaves and waxy covering of the leaves. The same three classes, wheat-like, *Aegilops*-like and intermediate occurred for the character of the ripe ear, shedding of the whole ear, outer glume characters and awns. As with the vegetative characters there was correlation between the general habit of the ear and most of the characters of the ripe ear. A large number of these is inherited as a complex, though the linkage is never complete.
The behaviour of the individual progeny is described.
The pollen sterile F_2' plants gave, with only one exception, only pollen sterile plants ; the more or less self-fertile plants segregated into pollen sterile and self-fertile plants. All plants with dehiscent anthers were more or less self-fertile.
Wheat alone was used for backcrossing. Very poor results were obtained by backcrossing pollen sterile F_2' plants but there was a slight increase as compared with the results of F_1 The backcrossing of self-fertile plants gave a lower set of grain than by selfing, so that some elimination of female fertile gametes and of zygotes must occur.
There was a great variation among the different progeny.
The number of completely sterile ears of the pollen sterile plants decreased slightly in F_2' as compared with F_1 but increased again in F_3'.
In the self-fertile plants the self-fertility increased in F_2' and F_3'.
Constant forms were obtained in the F_1 of *Ae. caudata* x *T. dicoccum*, *Ae. triuncialis* x *T. dicoccum*

and in the F_2' of *Ae. triaristata* x *T. vulgare* and in F_3' all were partially self-fertile but shewed a higher fertility than that of the non-constant forms.
The plants with intermediate type of ears had on an average a higher fertility than the wheat-like and *Aegilops*-like plants.
The relation between fertility and seven easily recognizable *Aegilops* characters was investigated. Correlation was found only between shedding of the whole ear and presence of awns on the outer glume.

383. VERUSHKINE, S. and SHECHURDINE, A. 633.11:575.127.5:633.289
Hybrids between wheat and couch grass. Fertile *Triticum-Agropyrum* hybrids of great scientific and practical interest.
J. Hered. 1933 : **24** : 328, 329–35.

A pure line of *T. vulgare* var. *lutescens* has been successfully crossed with *Agropyrum intermedium*. The latter species crosses readily with forms of *T. durum*, *T. dicoccum* as well as with the spring and winter types of *T. vulgare*. *Agropyrum elongatum* too hybridizes without difficulty with hard and soft wheats. Both varieties of *Agropyrum* are perennial and cross-pollinating though self-pollination may occur.
All crosses of pure lines of wheat with *A. intermedium* and *A. elongatum* gave positive results but the percentage of fertilization varied considerably, probably owing to the different compatibility of the parental forms of wheat and couch grass used, the success of the cross depending on the selection of suitable parents, as is also the case in other generic crosses.
The seed from crosses of *T. vulgare* by *A. intermedium* and *A. elongatum* possess clearly differentiated embryos and, as a rule, abortive endosperms ; whereas *T. durum* pollinated by the same two species of *Agropyrum* resulted in normal seed and only in rare instances was the endosperm not well filled.
In the majority of cases the hybrid seed from crosses of *T. durum* x *A. intermedium* and *A. elongatum* is indistinguishable from the seed of the maternal plants, while this was so only in a few cases in certain pairs of crosses with *T. vulgare*. It is therefore not surprising that out of 134 seeds from the *T. durum* x *A. intermedium* cross 81.3 per cent germinated, whereas out of 836 seeds from the cross of *T. vulgare* x *A. intermedium* only 62. 4 per cent germinated. The developmental characteristics of the F_1 plants of the above two crosses are described. In all cases the F_1 was perennial and shewed clear dominance of the couch grass characters, only a few plants shewing intermediate characteristics of ear structure. The prolongation of the vegetative period in the F_1 is attributed to the longer vegetative period typical of North Caucasian forms of *A. intermedium*.
Complete self-sterility characterized all the F_1 hybrids from *T. vulgare* x *A. intermedium* and most of the plants from the cross *T. durum* x *A. intermedium* ; and the F_1 plants exhibited the open type of blooming. The ♀ reproductive organs appeared normal but the anthers in most cases were leathery and non-dehiscent though often containing yellow pollen. Some normally blooming and partially self-fertile plants were observed among the progeny of the *T. durum* cross.
The hybrids resulting from *T. vulgare* x *A. elongatum* and *T. durum* x *A. elongatum* shewed similar results and here again dominance of the couch grass parent and some degree of self-fertility in the *T. durum* cross were evident.
Repeated pollinations of the F_1 from *T. vulgare* x *A. intermedium* gave a very low set of seed of heterogeneous appearance but intermediate in size and shape between the seed of *T. vulgare* and *A. intermedium*. A small number of such backcross hybrids displayed the perennial habit and on the whole resembled the wheat parent. One adult plant in five proved partly self-fertile.
The F_2 generation was also crossed with wheat and yielded 10 per cent. of grain.
Other species also used as ♀ parents with *A. intermedium* were *T. dicoccum* and *Secale cereale*, the first yielding 30.47 per cent seeds from 128 pollinated flowers and the second 12.5 per cent from 40 flowers.
The following species were also used as ♀ parents with *A. elongatum* and the resulting set of seed is tabulated :—*T. persicum* x *A. elongatum*, *T. turgidum* x *A. elongatum*, *T. sphaerococcum* x *A. elongatum*, *T. compactum* x *A. elongatum*, *T. monococcum* x *A. elongatum*.

384. 633.11:575.242
NISHIYAMA, I. 633.13:575.242
(**On the mechanism of the fatuoid and speltoid mutation.**)
Kwagaku (Japan) 1933 : **3** : 147–52.

Of the three types of fatuoids which have arisen by chromosome aberration, the c type (Huskin's C series) is the result of the loss of a part, s_2, of the c chromosome. The heterozygous fatuoids from this type have therefore 20 bivalents plus a heteromorphic pair of chromosomes. A critical examination of the data on speltoid wheats suggests that the C series speltoids possess, like the fatuoids of the c type, a heteromorphic pair of chromosomes and 20 normal bivalents.

385. CHIZAKI, Y. 633.11:576.356.52
(**On the occurrence of haploid plant in *monococcum* wheat.**)
Proc. Crop Sci. Soc. Japan 1933 : **5** : 267–70.

During a period of intense heat, probably over 35°C., a haploid individual was discovered among some late blooming plants of *T. monococcum*. The haploid form which was considerably smaller than the normal in height, length of ear and of leaf and breadth of leaf shewed 7 independent univalent chromosomes in most of the pollen mother cells at metaphase of the first division. The irregularities of these univalents on splitting are described. Pollen mother cells with 5 univalents and one double chromosome composed of a vertical combination of two elememts of almost equal size were also observed. In some cases too, only one daughter nucleus was formed at the first division owing to all the chromosomes gathering at one pole only.
The author is inclined to attribute this instance of haploidy either to mere stimulation of the reduced egg cells by the pollen which may have lost its fertilizing capacity owing to the high temperature, or to parthenogenesis of the reduced egg cells due to the stimulus of heat alone.

386. JONARD, P. 633.11:581.142:575.061.6
Relation entre la couleur du grain des diverses variétés de blé et leur aptitude à germer en moyettes. (**Relation between the grain colour of the different varieties of wheat and their tendency to germinate in the stook.**)
Sélectionneur 1933 : **2** : 41–48.

White grained varieties tended to germinate in the stook more freely than the red grained forms, thus confirming Nilsson-Ehle's theory of the inhibitory influence of colour factors on germination.

633.11:581.48:575.061.6:575–181
387. TSCHERMAK, E. 633.14:581.48:575.061.6:575–181
Über den Grössen- und Farben-Dimorphismus der Körner bei den Wild- und Kulturformen des Roggens und Weizens. (**On the size and colour dimorphism of the grains of the wild and cultivated forms of rye and wheat.**)
Z. Züchtung 1933 : A **18** : 431–36.

The first and lowest grain of the spikelets of varieties of wild rye, *Secale montanum*, *S. anatolicum* and *S. fragile*, of wheat *Triticum villosum*, and of *Aegilops*, *Ae. ovata*, *Ae. triaristata* and *Ae. ventricosa* besides being the smallest and lightest in weight, because of pressure from the surrounding glume, are always brown in colour. The second grain, if it develops, is larger, heavier and yellow, while if a third grain is formed it is less heavy and pale in colour and this correlation of characters is hereditary.
In a cross between cultivated rye which does not shew dimorphism of the grains and *S. montanum*, the F_1 shews the dimorphism and there is segregation in F_2 independently of the other characters of the wild form. There was not sufficient material for a numerical analysis.
The characters are inherited in the constant *Aegilops-Triticum* hybrids and in the species hybrid *T. turgido-villosum*.
The pressure of the glumes is found to affect not only the shape but also the quality of the grains.

388. 633.11–1.524.4:575.42(47.1)
PESOLA, V. A. 633.11 Pohjola
Maatiaissyysvehnään kohdistuneesta jalostustyöstä ja sen tuloksista. (**The Finnish native winter wheat as breeding material.**)
Maataloustieteellinen Aikakauskirja 1933 : **5** : 97–107.

Pohjola, a new strain selected by the author from a local wheat, is described.
In comparative trials with Swedish and other Finnish varieties Pohjola shewed excellent winter-hardiness, but the straw was not very stiff and rust resistance not entirely satisfactory.

389. TAVČAR, A. 633.11–1.81.031–1.557
Die Mineralstoffentnahme durch den Ernteertrag bei den Winterweizensorten. (**The withdrawal of mineral matter from the soil in the production of the crop in varieties of winter wheat.**)
Z. Züchtung 1933 : A **18** : 545–70.

Pure lines of 6 varieties of Jugoslavian land wheats and 76 foreign sorts belonging to *T. vulgare aristatum*, *T. turgidum*, *T. durum erytromelan* and *T. compactum* were used. Data are given of the meterological conditions during the time of the experiment.
For each variety the growth period, yield (grain and straw), hectolitre weight, 1,000 grain weight, chemical analyses of grain and straw and the economic value of individual sorts according to the systematic groups, were determined.
It was found that varieties which shewed a higher grain yield per unit of surface have on an average a smaller ash content in grain and straw than those with a lower yield.
From this follows the conclusion that those varieties which have a higher yield of grain used less mineral matter than those with a lower yield.
The systematic grouping is not a satisfactory guide to the qualitative and quantitative grain and straw yield of individual varieties.

390. ILJNSKY, B. and LEVITSKAYA, V. 633.11–2.111–1.521.6:575.11
(**Variability and inheritance of biochemical character and winter-hardiness in winter wheats.**)
Nauk. Zapiski Tsukr. Prom. 1933 : **10** : 13–38.

Analyses were made of 4,628 plants of the hybrid and parental forms. The analyses of the different varieties confirmed the relationship existing between high sugar content and cold resistance. For genetic studies more detailed knowledge is required however, and investigations were made on the sugar content of the individual plants comprising a variety. The plants of five varieties and their hybrids were arranged according to their sugar content and the coefficient of variation determined. For all varieties this was high, especially for Saratov 0329, which varied from 6 to 53 per cent sugar. In this variety a preponderance of individuals with high sugar content was evident, in certain other less hardy varieties those with low sugar content were in excess.
The autumn sugar and ash content of the hybrids was also determined. No marked or regular differences between the reciprocal crosses were observed. The F_1's were generally intermediate in respect of both sugar and ash content, though in certain crosses the sugar content corresponded to one of the parents and in one case exceeded both. The variation coefficients were on the whole less than those of the parents and the frequency distribution illustrated the intermediate nature of the F_1's, all but one of which shewed a preponderance of high sugar individuals.
The variation in sugar content in most of the F_2's was greater even than in the parents ; the arithmetic mean for most F_2's was intermediate between the parents ; in the cross Kooperatorka x Durable it coincided with that for the latter parent, and in the cross Ukrainka x Kooperatorka it was below both parents.
The extreme types of the F_2 in respect of sugar content were chosen to produce an F_3. The mean sugar contents in F_3 were mostly intermediate between the parents, but in Ukrainka x Kooperatorka it exceeded, and in Saratov 0329 x Durable was below the two parents.
The variation in the F_3 was less than in the F_2, never surpassing, and rarely attaining the parental limits. Though some of the F_3 families displayed deviations from the character of the F_2 plant

from which they were chosen, many of them retained these characteristics and it is hoped that this will also be the case in later generations.
Though no definite factorial scheme can be propounded, the results indicate that the varieties Saratov 0329 and Durable differ in not more than one factor, and Saratov 0329 and Ukrainka or Kooperatorka in not more than two, the two latter varieties differing possibly in quality but not in number of factors. Modifying factors may also be involved. Other factors influencing the rate of production of sugars, and thus connected with the enzyme activity of the plants, also influence the results.
The degree of frost damage suffered by the F_2 hybrids became gradually greater with increasing susceptibility of the parents. The rapidity with which the plants resume growth after the winter and after damage also proved to be a hereditary character.
The correlation between the sugar content and cold resistance makes the method a valuable aid to breeding, though on account of the variability of the former character its use is recommended only in the later stages, when it is possible to take representative samples from fairly large populations.

391. GAUDINEAU. 633.11–2.451–1.521.6:575
Les blés et la carie. (**Wheat varieties and bunt.**)
Sélectionneur 1933 : **2** : 15–19.
Some data on bunt resistance trials to which most of the varieties tested were susceptible. Resistance varied according to the source of infection material.

392. GAINES, E. F. and SMITH, W. K. 633.11–2.451.3:575.11
Reaction of varieties and hybrids of wheat to physiologic forms of bunt.
J. Amer. Soc. Agron. 1933 : **25** : 273–84.
The differentiation of five physiological forms of *Tilletia tritici* and at least two forms of *T. levis* was achieved by tests upon 11 autumn sown and 15 spring wheats. The reactions of 27 winter wheats to certain single cultures and mixtures of these forms are also described. Among the 12 varieties resistant to all the forms tested were five varieties that had been evolved by hybridization from wheats not resistant to all these forms ; in some cases added resistance seemed to be derived from a susceptible parent, as in Albit and also Jenkin x Redit.
The following genetical findings are also of interest :—
Hohenheimer is highly resistant to forms T2 and L4 to which White Odessa is susceptible ; while both these wheats are moderately resistant to T11. Crosses between these two varieties shewed that the factor in Hohenheimer for strong resistance to T2 is also responsible for the strong resistance to L4. The same factor also induces the moderate resistance of Hohenheimer to T11.
In the reaction of progenies to T11, well-marked transgressive segregation was observed, some progenies being much more resistant and some much more susceptible than either parent.
A single main factor, different from the factor for resistance in Hohenheimer in all probability determines the moderate resistance of White Odessa to T11.

393. SCHELOTTO, B. 633.11–2.451.3:576.16
Algunas investigaciones sobre la " caries " del trigo. (**Some investigations on bunt of wheat.**)
Bol. Chacra Exptl. " La Previsión." 1932–33 : **1** (4) : 40–47.
Tests with *Tilletia tritici* (Bjerk) Wint. on 14 varieties and new hybrids shewed 5·7 per cent. greater infection when infected material from the variety to be tested was employed, this was especially so in the case of the varieties Fénix and La Previsión 3.
The varieties were much more attacked by local bunts than by bunts obtained from Europe.
Studies were also made on the longevity of the spores.

394. SMITH, W. K. 633.11–2.451.3–1.521.6:575.11
Inheritance of reaction of wheat to physiologic forms of *Tilletia levis* and *T. tritici*.
J. Agric. Res. 1933 : 47 : 89–105.
Hope, a spring wheat (*Triticum vulgare*) which when spring sown is highly resistant and when autumn sown is susceptible to three physiological forms of *Tilletia tritici* (T–1, T–2, T–3) and two forms of *T. levis* (L–4, L–5), was crossed with Jenkin, a spring variety of *Triticum compactum* which is susceptible to the same five forms. Judging from the results of inoculations of seed of the F_2 plants, the Hope factors for resistance to any one of the physiological forms seemed to be the same for all five. Dominance of either resistance or susceptibility could not be detected. It seemed probable that Hope and Jenkin differed in their reaction to the five forms of bunt by three main factors.
The F_3 progenies from Hope crossed with the winter wheats, White Odessa and Ridit, were tested under conditions of spring and winter sowing with L–4 to which White Odessa is moderately resistant and Ridit highly so.
Though the number of factors operating could not be determined owing to small number of plants in the Hope x White Odessa cross, it is probable that the two winter wheats carry at least some of the same factors as Hope for resistance to L–4 when spring sown.
The Hope x Ridit progenies indicated that the Hope reaction to L–4, with autumn sowing, differs from the Ridit reaction by one major factor.
No evidence of linkage between factors for the bunt reaction and factors for awn length, glume colour, or winter or spring habit was discoverable.

395. SMITH, G. S. and CLARK, J. A. 633.11 *durum* –2.452–1.521.6:575.11
Inheritance of stem-rust reaction and correlation of characters in Pentad, Nodak, and Akrona *durum*-wheat crosses.
Tech. Bull. U.S. Dept. Agric. 1933 : No. 385 : Pp. 27.
Three strains of *durum* wheat were used in these experiments, Pentad, rust resistant, Nodak, slightly less rust resistant and Akrona, susceptible.
The F_1 of the cross Pentad x Nodak was intermediate in reaction to rust but on the average inclined towards the more susceptible parent. There were indications in F_3 of transgressive segregation for greater susceptibility and a difference between the parents of two complementary minor genetic factors is assumed, as well as a single dominant factor for infection in each parent variety.
The F_1 of the cross Pentad x Akrona was also intermediate but with a tendency towards partial dominance of susceptibility. Two major dominant factors for susceptibility are indicated. Strains, homozygous for the resistance of Pentad were found in F_4.
The result of the cross Nodak x Akrona indicated that the parents may differ by two major genetic factors as well as in two minor or modifying factors. From none of the crosses were immune plants obtained or plants with a greater resistance than that of the parents.
Data on yield, test weight, plumpness of grains and grain weight, heading, ripening, fruiting period, gasoline colour and protein content indicated a complicated inheritance. The relation between the characters was determined by simple and partial correlation coefficients.

396. MIÈGE, E. 633.11:664.641.016(64)
Étude de la valeur semoulière des blés durs marocains. (**A study of the semolina value of the hard wheats of Morocco.**)
Rabat 1933 : Pp. 55.
Following a description of the selected hard wheats and the local and the indigenous varieties in Morocco, the results of tests of their semolina value are recorded. In general the selected varieties proved superior, one strain, No. 250, exhibiting excellent semolina quality and yield. Certain new hybrids also gave excellent results, their yield of semolina ranging between 69·5 and 73 per cent. Environmental influences are discussed.
The 1932 crop was also tested by means of the Teysset-Rose-Brault apparatus for grading the various sizes of semolina ; and here again the maximum of coarse and medium semolina grades

was obtained from the selected varieties, the common and indigeneous types producing a high proportion of the finest grades.
An attempt was made to replace the usual organoleptic estimation of semolina quality by the use of the Chopin extensimeter for the study of physical properties of the gluten of hard wheats, and a suitable technique was evolved. The results, though less accurate than for the soft wheats, promise a useful means of ascertaining the mechanical properties of hard wheat pastes. As in soft wheats the gluten content is apparently independent of the quality and quantity of the semolina types. Moreover, a *Triticum durum* can be distinguished from a *T. vulgare* with almost complete certainty by the index of distension given by the extensimeter. Also, W being equal, a hard wheat has a greater tenacity and less elasticity than a soft wheat.

397. MIÈGE, E. 633.11:664.641.016(64)
La valeur boulangère des blés du Maroc en 1932. **(Baking quality of wheat in Morocco in 1932.)**
Casablanca 1933 : Pp. 180.

A full report on the baking quality of 8 selected soft wheat varieties, 13 new hybrids bred by the Rabat Station, 4 of the most common wheats in Morocco and finally some unnamed indigenous varieties. The effects of environment in its various forms e.g. manuring, irrigation, heat, storage, etc were also recorded, and baking tests were made including tests of mixtures of soft and hard wheat, and certain correlations between gluten content and baking quality, and other technological properties were studied.
A general improvement in the selected strains of soft wheats was revealed ; and selected early varieties proved superior to the late types and the common and indigenous wheats. A rather close relationship was found between quality and earliness.
Chopin and Comparator extensimeter determinations on the whole gave results which corresponded to the baking tests.

OATS 633.13

398. 633.13 Engelbrekt II
TORSSELL, R. 633.13 Stormogul II
Svalöfs Engelbrektshavre II och Stormogulhavre II. **(Svalöf Engelbrekt oats II and Stormogul oats II.)**
Sverig. Utsädesfören. T. 1933 : **43** : 231–50.

Comparative tests of these two varieties, which were selected from a cross between Stormogul and Klock II, were made at the Seed Union branch stations.
Engelbrekt II had on an average a higher yield than the other varieties tested with it. In size and quality of grain Engelbrekt II represents a certain, though not great, amount of improvement. It is not quite so early as Engelbrekt I but has definitely stiffer straw.
Stormogul II shews a certain advance in yield and was only surpassed in one place by Argus and Engelbrekt II.
In straw yield, grain quality, earliness and hectolitre weight Stormogul II closely resembles Stormogul I but surpasses it in straw stiffness.
The morphological characters of the two varieties are briefly noted and their value for the different oat growing districts of Sweden is discussed.

399. 633.13 Lee
New variety of oats developed in state.
Ext. Farm-News 1933 : **18** : p. 2.

Lee, the new variety, bred by the North Carolina Experiment Station is a hardy winter oat with yellow, plump grains, yielding a good weight of grain per bushel and a heavy yield of good quality straw. The average yield for 8 years was 56·7 bushels.

400. 633.13:575.061.6
ANDERSON, A. and KIESSELBACH, T. A. 633.13:575.42
Selection within Burt oats.
J. Amer. Soc. Agron. 1933 : **25** : 684–88.

The initial material, composed of 735 promising and productive plants of the Burt variety, was subjected to selection for grain colour and yield.

The term coloured was applied to any colour of grain other than white or yellow. Colour expression was found to be materially affected by environment.
There was a much greater tendency for dark seeds to reproduce their colour than for light seeds to do so.
The results shewed that the Burt variety contains both light and dark coloured strains inherently higher yielding than the variety itself.
Though no actual correlation between high yield and grain colour was found, still high yielding coloured strains occurred most frequently.
A number of the high yielding strains also shewed more or less disease resistance, three strains being markedly resistant to stem rust in one year and three others to smut for several years.
Of the strains grown in field plots after nursery testing, No. 33 ranked first during a 4-year period with a yield of 9 per cent more than the original variety. It was also the most productive of the 35 selections tested in the nursery for 7 years, having a yield of 18 per cent more than the original Burt.

401. Åkerman, Å. 633.13:575.061.633:575.182
Untersuchungen über die Vererbung gelb- und weissgestreifter Blattfarbe beim Hafer. **(Investigations on the inheritance of yellow and white striping of the leaf colour in oats.)**
Bot. Notiser 1933 : 255–70.

Plants with white stripes on the leaves were found in a plot of the variety 01131 from the cross Kronen x Strubes Schlanstedter. Seeds from these plants produced striped and green plants. On selfing, the striped plants could be divided into strongly and weakly striped and their progeny shewed a higher proportion of the parent type.
The strongly striped plants died off in the seedling stage. Of the green plants, some bred true to green, others segregated out striped and green plants.
Direct and reciprocal crosses between striped and normal plants shewed clearly that the type of variegation is inherited only through the maternal parent.

402. Fore, R. E. and Woodworth, C. M. 633.13–1.557:575
Analysis of yield in certain oat varieties.
J. Amer. Soc. Agron. 1933 : **25** : 190–202.

As an aid to research on the inheritance of yield in oats an attempt has been made to analyse the complex character of yield into its constituent parts.
Data were taken on about 100 individual plants of each variety for 12 characters influencing yield. These characters were tillers per plant, panicles per plant, whorls per plant, branches per plant, yield per plant, yield per panicle, whorls per panicle, branches per panicle, branches per whorl, percentage of sterile spikelets, percentage of hull, and average seed weight. All characters were considered on a plant or panicle basis. The means of varieties were used as a basis for all comparisons.
Significant varietal differences were found for all characters upon which data were taken. Lists are given of the positive and negative correlations found as well as the high correlation between yield per plant and number of whorls per plant and also number of branches per plant. In addition, small but significant correlations between yield per plant and number of panicles per plant and also number of branches per whorl were noted.
Crossing experiments are in progress to confirm, if possible, the genetical nature of the various relationships discussed in this paper.

403. Stanton, T. R. and Murphy, H. C. 633.13–2.452 *Puccinia coronata*–1.521.6
Oat varieties highly resistant to crown rust and their probable agronomic value.
J. Amer. Soc. Agron. 1933 : **25** : 674–83.

The origin, nomenclature and probable economic value of Bond, Kareela, seven Victoria and Capa strains and four strains of Red Algerian oats are described.
Bond (C.I. No. 2733) shewed remarkable resistance to crown rust being nearly immune to 16

forms collected in 1931 including the most aggressive and virulent forms known in United States, Canada and Mexico. It is susceptible to stem rust but seems resistant to certain forms of the loose and covered smuts of oats, and has also desirable economic qualities.
Kareela, a desirable Fulghum type, is partially resistant to crown rust, gave a good yield when spring sown and is regarded as worthy of further study.
Of the Victoria strains, C.I. Nos. 2401 and 2764, have exhibited high resistance to 32 physiological forms of crown rust during 1927–31. Unfortunately both are susceptible to the forms of stem rust prevalent in North America, but, on the other hand, have shewn high resistance to forms of loose and covered smuts in the United States.
Other varieties shewing considerable resistance to crown rust were Capa (C.I. No. 2765), Pampa (C.I. No. 2767) and Alber (C.I. No. 2766). Alber proved resistant to 20 out of the 27 forms of crown rust used in the test and has, when autumn sown, given good yields. In general, however, the various strains of Victoria and Capa have given low yields and are probably of little economic value.
The chief value of these new crown rust resistant strains lies in their potentialities as breeding material.

RYE 633.14

404. Jung, E. 633.14
Über die Beziehungen zwischen Befruchtungsprozentsatz, Tausendkorngewicht und Kornertrag bei Winterroggen. (**On the relation between fertility percentage, thousand grain weight and grain yield in winter rye.**)
Z. Züchtung 1933 : A **18** : 526–44.

Six varieties of winter rye were used for the experiment and the results shewed that among varieties there was no regular relation between the mean fertility percentage and either the 1,000 grain weight or the average yield per ear. There was, however, a positive correlation between these characters within a variety, though with considerable variation.
As, however, large and heavy grains may come from partially sterile ears it is important for the plant breeder to know something of the origin of the grain and not to depend on selection by eye.

405. Darlington, C. D. 633.14:576.354.46
The origin and behaviour of chiasmata, VIII. *Secale cereale* **(n, 8).**
Cytologia 1933 : **4** : 444–52.

The behaviour at meiosis of the smaller segment (k) of the extra chromosome in 8n chromosome plants was examined. Regular pairing of the 7 major bivalents with 1–4 chiasmata was found.
The segment (k) had a subterminal spindle attachment dividing it into two parts in the proportion of about 1 to 7. The chiasma frequency of the two parts was about proportional to their length.
Terminalization was always complete in the segment (k), but not in the major chromosomes.
A negative correlation (–0·330) was found between the chiasma frequency of the segment and that of the major chromosomes. In one case in a group of eight cells an association of four chromosomes in rings or chains was observed. Spontaneous interchanges at some period before meiosis is assumed.

406. Bos, H. 633.14:581.143:575
Het vegetatierhythme van de rogge. (**The vegetative rhythm in rye.**)
Landbouwk. T. Wageningen 1933 : **45** : 387–96.

Evidence of innate differences in rhythm was found in various spring varieties ; samples of mountain rye when sown in Holland retained the mountain characteristics of late earing, sprouting and flowering, combined with earlier ripening. The progeny could not be tested.
In a Petkus winter rye, sown in April, only a few feeble plants appeared, but at a very early stage there appeared on two adjacent plants one and two ears respectively. These on being isolated, so that mutual crossing only could occur, produced 26 plants of which 21 had the spring rhythm and 5 the winter rhythm. This is interpreted as a case of direct hereditary transmission of the rhythm. All the 52 F_2 from the F_1 spring form appear to have retained the spring rhythm.

407. Dombrovskaja, E. Ju. 633.15(47)
(**Varieties of maize.**)
All-Union Inst. Grain Ind. Saratov 1932 : 141–62.
Data are given on the yields of twelve maize varieties tested at Saratov over 6 years.
The varieties in the early, medium and late groups giving the highest yields are indicated for the different years, full details being given of the weather conditions in the respective years.
The main agronomic characters of the varieties are briefly described.

408. Grieder, A. 633.15(81)
Der einheimische Mais Zentralbrasiliens. (**The indigenous maize of Central Brazil.**)
Tropenpflanzer 1933 ; **36** : 250–55.
Ten of the best Brazilian varieties are described. In comparison with the varieties of North America they are frequently richer in water and protein but generally poorer in nitrogen and fat.

409. Pirovano, A. 633.15:538.6
Effetti dell'induzione elettrica nella embriogenesi. (**Effects on electrical induction on embryogeny.**)
Atti 2nd Cong. Ital. Genet. Eugen. Roma 1932 : 281–85.
Ears of maize were treated by a new method just before anthesis.
The amount of abortion was the greater the earlier the treatment was begun and the slower the development of the plant.

410. Lieber, R. 633.15:575(43)
Beobachtungen und Arbeitsergebnisse in der badischen Maiszüchtung. (**Observations and results in maize breeding in Baden.**)
Züchter 1933 : **5** : 193–96.
Both cob formation and size are genetic characters and with the development of maize culture for grain in Baden, selection has been made against the tendency to absence of cob. The shank has been reduced by 11 per cent by breeding, with an accompanying increase of 20 per cent in the yield. This negative correlation between shank and yield does not, however, always hold, and the nature of the soil may also affect the proportion of shank present.
As a result of 12 years' breeding work with the Yellow Baden land maize the cob length has been increased by 12·8 per cent, the grain number per cob by 4·4 per cent, the 1,000 corn weight by 6·8 per cent and the yield of grain by 28·2 per cent.
The use of maize as silage and fodder has lent added importance to plant height, foliage, size of stalk and tillering. Since no correlation was found between yield of grain and fodder the grain test only is used in selection work with the usual observations on the vegetative development. For evaluating results from widely different morphological varieties, however, both grain and weight of stalk and leaves are determined.
Work is being done on varietal resistance to smut, but until a reliable immune variety and a fuller knowledge of the conditions of artificial mass infection are available no great progress can be made.
The problem of emasculation and of cross fertilization is mentioned. An experiment shewed no significant difference in grain yield from detasselled and non-emasculated plants.
Research is in progress on the use of artificial fertilization in inbreeding followed by crossing to obtain heterosis. The degeneration phenomena due to inbreeding were not marked in the average yield though length of plant and of cob and also tillering were affected and an increased number of hermaphrodite flowers were observed. Varietal differences in the degree of degeneration caused by inbreeding were found. So far, the yields from various interfertilized strains after inbreeding shewed a continuous increase for individual strains reaching 29 per cent after 3 years of self-fertilization ; but the average is scarcely higher than that obtained by ordinary breeding. Possibly indigenous German maize carries a relatively small part of the genetic material of the species and having become comparatively homozygous after centuries of cultivation does not exhibit heterosis in a marked degree.

411. SPRAGUE, H. B. and CURTIS, N. 633.15:575.061.6:575.12
Chlorophyll content as an index of the productive capacity of selfed lines of corn and their hybrids.
J. Amer. Soc. Agron. 1933 : **25** : 709–24.

The chlorophyll content of inbred strains of maize as an index of the productivity of their hybrids was investigated after a simple technique, rapid and accurate and allowing of subsequent growth and normal ripening of the plant after sampling, had been evolved.
Differences in chlorophyll content and yields of 12 nearly homozygous selfed lines of maize and the relations between such lines and their first generation hybrids were determined.
The chlorophyll concentration in the 12 lines varied from 5·14 mg. to 11·30 mg. per 100 sq. cm. of leaf, and the total chlorophyll per plant ranged from 106 to 407 mg. The lines also differed widely in leaf area, total yield of dry matter, and dehulled grain.
In 18 F_1 hybrids the chlorophyll concentration ranged from 6·23 to 11·61 mg. and the total chlorophyll from 332 to 607 mg.; and it appeared that the chlorophyll concentration of any given strain may be genetically either recessive, dominant, partly dominant or cumulative in relation to that of other selfed lines. It also seemed likely that chlorophyll inheritance, in contrast to leaf area and yield, is controlled by a relatively small number of genetic factors.
Mean values of the parental attributes of total chlorophyll, chlorophyll concentration, and leaf area were also significantly correlated with total dry weight of the hybrids. Mean chlorophyll concentration of the parents was also closely related to chlorophyll concentration and total chlorophyll of the hybrids.
Hence the mean values for chlorophyll concentration and total chlorophyll of selfed lines are reasonably reliable indexes of the total yield that will be produced by their hybrids.

412. BRIEGER, F. 633.15:575.1:578.08
Die Bedeutung des Maises als Demonstrations- und Versuchsmaterial für Vererbungskurse. (**The importance of maize as material for demonstrations and experiments in courses in genetics.**)
Züchter 1933 : **5** : 232–40.

The suitability of the maize cob as a means of demonstrating various genetic phenomena such as segregation, inbreeding and heterosis, polymery and epistasis, gametic segregation and linkage, etc. is made clear and information on the cultivation of experimental material and methods of crossing and genetic technique is given. The Mendelian factors and phenomena suitable for study are described.

413. LI, H. W. 633.15:575.116.1–181.13
Heritable characters in maize. XLV. Nana.
J. Hered. 1933 : **24** : 279–81.

In size, nana is intermediate between normal and dwarf. The internodes are normal in number but much reduced in length excepting the last one which carries the tassel. The leaves appear stiffened and rigid and are characteristically twisted.
A study of the linkage relations of this recessive character shews that it is located in the A–ts_4 chromosome, probably between these two factors. It is independent of the following characters; C, sh, wx, R, g, su, Tu, B, lg, Y, Pl, f, ts, ra, gl, pr, v_3, bv, and d_1.

414. KULESHOV, N. N. 633.15:575.2
World's diversity of phenotypes of maize.
J. Amer. Soc. Agron. 1933 : **25** : 688–700.

The extremely wide area of distribution (totalling 195 million acres of the earth's surface) and the consequent wide differences in environmental conditions accounts to some extent for the great diversity that exists in the types of maize. Considerable variation in the length of the growing season is also evident from Russian investigations of about 8,000 kinds of maize. The index used to determine the growth period was the number of leaves on the main stem of the maize plant, the earlier varieties having fewer main stem leaves and the latest having the maximum number.

In general the height of the plants of different varieties varies according to the length of the growth period.
In a study of the biological aspect of flowering, simultaneous flowering of male and female inflorescences and even proterogyny were found in maize samples from central Asia.
Vegetative types of maize have also been studied and where possible certain general types adapted to particular geographical regions or environments were defined.
The problem of the possible genetic cause of the occurrence of phenotypically identical characters such as the presence of glossy seedling? in samples from various parts of the world is mentioned.
The geographical distribution of the systematic groups of maize in America (its original habitat) and in the old world is outlined.
From a brief consideration of the diversity within the individual systematic groups it is suggested that the groups *saccharata*, *amyleasaccharata* and *ceratina* are phylogenetically the youngest, while the exceptional variability of the group *amylacea* and various historical data tend to shew that this variety is the oldest known.
A study of inheritance in the extra late varieties which have not yet been genetically investigated is recommmended.

415. Rhoades, M. M. 633.15:576.356.2
An experimental and theoretical study of chromatid crossing over.
Genetics 1933 : **18** : 535–55.
This paper presents more extensive data on the subject of chromatid or double strand crossing-over in *Zea mays* than was given in the preliminary report summarized in " Plant Breeding Abstracts " Vol. III, Abst. 69.
Besides further evidence for the occurrence of chromatid crossing-over there are indications that the locus of *pr* is much closer to the insertion region than is v_2.
A trisomic v_2 plant was found to have 32 chromosomes and doubling is shewn to have taken place during the gametophytic generation.
The effect of chromatid crossing-over upon the genetic ratios in triploids and trisomes is discussed and the data of Bridges, Anderson and Redfield on crossing-over in triploid *Drosophila* is critically examined to find support for a possible correlation between crossing-over and disjunction.

416. Sprague, G. F. 633.15:581.331.23:575.12
Pollen tube establishment and the deficiency of waxy seeds in certain maize crosses.
Proc. Nat. Acad. Sci. Wash. 1933 : **19** : 838–41.
A technique was devised for studying germination of maize pollen and the establishment of the pollen tubes and data was obtained on the relative rates of establishment of the pollen tubes from closely related strains homozygous for the SuWx, Suwx, suWx and suwx genotypes. Paired comparisons were used to eliminate as far as possible uncontrolled variables such as temperature, humidity, etc.
The time required for the germination of waxy pollen and the establishment of the pollen tube is consistently greater than for the non-waxy type ; and when wx pollen is produced by a susu plant this difference is greatly increased. There is no significant difference in the time required for germination and establishment for pollen of the constitution SuWx suWx.
Tests of the growth rate of SuWx, Suwx, suWx and suwx pollen from the time of establishment shewed no or only a very slight difference between the four types of pollen for the period studied. Hence the slight deficiency of waxy seeds from SuSu Wxwx selfs and the greater deficiencies from susu Wxwx selfs are explainable on the basis of the longer time required for germination and establishment.
The time required for establishment appears to be directly related to the degree of contact between the pollen grain and the stigmatic hair. It is evident that the two components of pollen tube growth, differential establishment and differential growth, must be clearly distinguished.

417. BRINK, R. A. 633.15:581.45:575.11
Heritable characters in maize. XLVI. Liguleless–2.
J. Hered. 1933 : **24** : 324, 325–26.

Two strains of the variety Golden Glow were found to be segregating for the liguleless character. Both were crossed with a standard liguleless strain and in one case the F_1 were all liguleless and in the other all normal, shewing that one of the strains carried a different gene for the ligule character lg_2. The morphological effects of the new gene on the plant are indistinguishable from those of lg_1. It is linked with a_1 and d_1 probably in the order a_1–lg_2–d_1 and is probably in the neighbourhood of na.

BARLEY 633.16

418. 633.16
TALANOV, V. V. (Editor) 633.13
(The sorts of grain crops and the regions of their distribution, Part II, Barley and oats.)
Lenin Acad. Agric. Sci., Inst. Pl. Ind., Division Var. Tests, Leningrad 1932 : Pp. 302.

The two crops are dealt with on lines similar to the earlier volume on spring and winter wheat (see " Plant Breeding Abstracts " Vol. III, Abst. 614).

419. KUCKUCK, H. 633.16:575.11"793"
Die Entstehung von Wintergersten aus Kreuzungen von Sommergersten und ihre prakische Bedeutung. **(On the origin of winter barleys from crosses of spring barleys and its practical importance.)**
Züchter 1933 : **5** : 196–99.

An abbreviated report of work previously described (see " Plant Breeding Abstracts " Vol. III, Abst. 651) with the following additional comment :—The analysis of the cross H10 x H13 from which transgressive-winter and spring types were ultimately isolated indicates that the spring type with a slight degree of winterhardiness is the original form which by natural selection has evolved in two directions producing the winter and spring forms.

420. POPE, M. N. 633.16:581.162.32:578.08
A rapid method of making small grain hybrids.
J. Amer. Soc. Agron. 1933 : **25** : 771–72.

The method consists first in cutting off the boot leaf below the base of the spike, removing base, tip, and lateral florets and clipping off the distal 2/5ths of the lemma and pale. The unbroken anthers are removed and the head bagged until the lodicules have separated lemma and pale widely and the stigma shews clearly, usually about two days after emasculation. An unemasculated spike of the variety to be used as the male parent is then chosen which shews extruding but undehisced anthers. This spike, with the tip held lower than the base, is gently tapped against the tip of the emasculated spike which is then rebagged.
A test count of 27 spikes thus cross-fertilized and containing 566 flowers, gave a set of 91 per cent of seed.
The absence of foreign pollen on the ♂ parent spike may be ensured by bagging.

421. 633.16–2.452 *Puccinia graminis* : 581.46
POWERS, L. and HINES, L. 633.16–2.452–1.521.6:575.116
Inheritance of reaction to stem rust and barbing of awns in barley crosses.
J. Agric. Res. 1933 : **46** : 1121–29.

The parents used in this investigation were (1) Glabron and Minnesota 462, two smooth-awned sib selections from a cross of Smooth Awn x Manchuria, and (2) the rough-awned Peatland derived from the variety Switzerland. The rough and smooth-awned plants were classed according to the segregation of the Rr factor pair, the Ss pair being ignored, and similarly two classes only were used for the susceptible and resistant plants since the homozygous and heterozygous resistant individuals could not be distinguished.

Resistance to *Puccinia graminis tritici* proved dominant to susceptibility, and in the Peatland x Glabron cross resistance and susceptibility were conditioned by a single factor pair (Tt).
The physiological forms isolated from the affected plamts were Nos. 17, 38 and 49.
The stem rust reaction and the barbing of the awns were not linked.

MILLETS AND SORGHUMS 633.17

422. HENDRY, G. W. 633.17
Grain sorghums in California.
Circ. Cal. Agric. Ext. Serv. 1933 : No. 74 : Pp. 33.
Contains descriptions and notes on the origins of a number of varieties.

423. ARNOLD, B. M. 633.171
(Millet.)
Ogiz. Selkolkhozguz, Moscow 1931 : Pp. 64.
Together with a number of general and cultural questions consideration is given to the different varieties of millet, their description, their agronomic characters, reaction to various unfavourable influences, the type of climate to which each is suited, yield and quality of the meal produced.
The main desiderata in millet breeding are chiefly outlined ; these being high yield and quality, resistance to drought, shedding, lodging and fungus diseases, suitable time of ripening for the various regions, large uniform and spherical grain giving coarse meal of good quality and flavour.
Suitability for mechanized cultivation is also important.
The characters of 12 of the best lines produced in the Soviet Union are tabulated. By the use of these improved varieties the yield and quality of grain of the millet crop have been notably increased.

424. SIEGLINGER, J. B. 633.177:575–181.13:575.24
A dwarf mutation in kafir.
J. Hered. 1933 : **24** : 336, 337–38.
The mutation which occurred in the F_5 generation of a cross between Red kafir and probably Reed kafir is recessive and very likely due to the loss of one of the factors for height conditioning normal stature. The mutant plant was about 20·6 inches high.

RICE 633.18

425. KASAHARA, Y. 633.18:575.061.6:575.113.7
(On some chlorotic lethal seedlings occurring in a pedigree of sterile rice plants.)
Proc. Crop Sci. Soc. Japan 1933 : **5** : 281–89.
From a number of sterile rice plants, fertile plants were obtained each year from 1925 until 1930 when some dull greenish-yellow individuals were found among these sterile and fertile plants. The new type which was 9–11 cm. high had only 28 per cent of the amount of chlorophyll found in green plants and withered within 40 days. The development attained by the dull greenish-yellow form was approximately the same as that of albino plants. Growth rate was not correlated with sterility or fertility. The new colour behaves as a simple recessive to green, giving invariably a 3 : 1 ratio.

426. 633.18:575.14
MERCADO, T. and JUACHON, P. 633.18:575.016.5:581.4
A report on a rice inbreeding experiment in the College of Agriculture.
Philipp. Agric. 1933 : **22** : 234–53.
A lowland variety of rice called Hambas was inbred and selected for six generations with the result that the yield was raised and two promising strains No. 908–16–29 and No. 908–16–30, yielding respectively 17·288 per cent and 15·766 per cent more per hectare than the parent variety were isolated.
By selfing, strains with larger or smaller grains than the original variety were obtained ; also the number of filled grains was reduced from bagged plants, though continuous planting of the inbred lines in the open gave an increased production of filled grains.

Some selected strains were found to have a longer period of maturity than the parent variety, others a shorter one.
A study of the genetic behaviour of red and white cuticle indicated that the Hambas variety is a natural hybrid between two varieties differing in cuticle colour.

ROOTS AND TUBERS 633.4

427. MUNERATI, O. 633.41:575.115
La possibilità di associare attraverso l'incrocio piu' caratteri recessivi in un unico tipo di barbabietola. Nota preventiva. **(The possibility of combining by hybridization a number of recessive characters in a single type of beetroot. Preliminary note.)**
Z. Züchtung 1933 : A **18** : 595–96.
A number of crosses were made in 1924 and have been continued of varieties with one or more different recessive characters in the expectation of combining a number of them within a single type, e.g. anthocyanin pigmentation, skin and leaf characters. The hope appears to be already realized and the type will be named *Beta paradoxa.*

428. 633.41:576.312.35
SIROTINA, M. 633.41:576.356.5
(Karyological study of *Beta vulgaris* L.)
Nauk. Zapiski Tsukr. Prom. 1932 : **20** : 87–100.
From an examination of samples of *Beta vulgaris* var. *saccharifera* All. var *crassa* All., var. *cruenta* All., and var. *cicla* L., 18 was established as the diploid chromosome complement, though a number of tetraploid nuclei and a tetraploid and a triploid rootlet were also observed.
These cytological findings confirm the morphological evidence upon which the systematists group all four of the above forms into one species.

429. 633.41–2.484–1.521.6
Cercospora resistant beet seed.
Through the Leaves, September 1933, p. 153.
The Great Western Sugar Company has succeeded in producing beet seed resistant to leaf spot or sufficiently so to reduce the losses due to this fungus in Colorado.

430. HARDENBURG, E. V. 633.491
Some false notions about potato varieties.
Amer. Pot. J. 1933 : **10** : 201–04.
A popular article on the various modes of origin and length of life of varieties of potatoes ; on the local geographical differences in the characteristics regarded as representing good quality ; and on the validity of variety tests.

431. CLARK, C. F., STUART, W. and STEVENSON, F. J. 633.491 Golden
The Golden potato. A new variety.
U.S. Dept. Agric., Bur. Pl. Ind., (Mimeographed) Pp. 4.
The Golden potato originated from a cross between two unnamed seedlings in a series of crosses which included both yellow-fleshed and white-fleshed varieties. The new potato gives high yields of medium sized well-shaped tubers of good quality. Its pedigree, description, characteristics and performance in comparative tests are given.

432. 633.491 Jersey Red Skin
633.491 Dakota Red Skin
STUART, W. 633.491 Dakota Seedling
The identity of " Jersey Red Skin " or " Red Skins."
Amer. Pot. J. 1933 : **10** : 199–201.
In identifying the Jersey Red Skin as the Dakota Red potato the writer incidentally found that the Dakota Red and the Dakota Seedling were not identical varieties. Descriptions of the above three varieties are given as fully as available data permitted.

433. Bleier, H. 633.491:576.3
Cytologische Untersuchungen an Kartoffeln (*Solanum*). (Sammelreferat.) [**Cytological investigations on potatoes (*Solanum*). (A survey of the literature.)**]
Züchter 1933 : **5** : 225–32.

Recent cytological research on the potato has been largely directed towards the elucidation of the problem of sterility. The present paper contains a critical survey of the ascertained facts and prevailing views relating to chromosome numbers in potatoes and in tuber-producing *Solanum* species ; pollen formation in varieties used in breeding, including irregularities of division and degeneration, the possible causes of both these phenomena and inviability of dyad pollen ; the meiotic behaviour of potatoes with 24 and 36 somatic chromosomes ; primary and secondary pairing ; the reduction division in species hybrids ; chimaeras and bud mutants ; and finally the phylogeny of the cultivated forms of potatoes.

434. Pissarev, V. 633.491–2.111–1.521.6
Kartoffelselektion auf Kälteresistenz. (**Selection of potatoes for cold resistance.**)
Z. Züchtung 1933 : A **18** : 582–94.

Comparative trials in 1931 of cold resistance in the new forms of potatoes of South America obtained by the Soviet expedition to that country shewed the following to be unaffected by – 5°C. of frost :— the cultivated forms *S. Juzepczukki* Buk., *S. ajanhuiri* Juz., et Buk., *S. curtilobum* Juz. et Buk. and the wild species *S. acaule* Bitt., *S. Bukassovi* Juz. and of forms of *S. demissum* Lindl. Moreover, slight frost effects on flowers and buds but no leaf injury were observed in *S. demissum*, *S. semidemissum* Juz. et Buk., 5 forms from central Peru, 9 from Southern Peru (including Pacus [? Paccus], taccla, ccusi, ccompis) and one form from Bolivia.

That frost resistance varies markedly within the species was evident especially from the behaviour of *S. andigenum* among the cultivated species and of *S. demissum* and *S. semidemissum* among the wild species.

Similar results were obtained also in 1931 at – 6°C. with certain species of the resistant group above mentioned and even at – 11·2°C. stalks and leaves remained green and among *S. demissum* plants even flowers and buds were found. The results in 1932 were again approximately the same ; and under artificial cold the wild form *S. acaule* retained its leaf buds at – 10°C. and continued to grow.

With such resistant material crosses had been begun in 1930 of *S. tuberosum* (48 *chromosomes*) x *S. andigenum* (48 chromosomes) and the other resistant species.

S. Juzepczukii (36 chromosomes), *S. ajanhuiri* (24 chromosomes) and *S. curtilobum* (60 chromosomes) crossed only with difficulty with *S. tuberosum* and the cross *S. acaule* (48 chromosomes) and *S. demissum* (72 chromosomes) also presented difficulties and special measures had to be taken to reduce the length of day to about 12 hours to maintain vegetative propagation and tuber formation in these species.

S. acaule and most *S. demissum* forms were highly fertile. *S. curtilobum* x *S. ajanhuiri* rarely formed berries and these species must be vegetatively maintained.

Since the practical aim of this work is to provide varieties suitable for the northern regions of the U.S.S.R., earliness is also required and field tests too of ecological adaptation were necessary. Experiments were therefore made near Leningrad and in the sub-artic region at the Chibiny Institute on Kola peninsula. Hybridization was not easily effected at Leningrad where the climate favours berry formation. The methods used at both centres are described in some detail.

The most accurate method of determining cold resistance proved to be not the refractrometric method, but direct freezing, either natural or artificial.

Under sub-arctic conditions crosses of *S. tuberosum* and *S. andigenum* forms gave F_1 plants that were higher yielding and earlier than the parent forms, a fact which should facilitate the breeding of cold resistant, and at the same time early maturing varieties.

Again in 1932 *S. acaule* ranked first as regards cold resistance, certain forms of *S. demissum* taking second place and the forms *S. andigenum*, taccla, Pacus [? Paccus] and others closing the series. From a number of F_1 and F_2 seedlings cold resistant clones have been selected for further investigation.
The crosses of Epicure x *S. andigenum* yielded F_1 clones remarkable for cold resistance, large tuber size and high yield.
In general, cold resistance behaved as a dominant in crosses of all cold resistant South American varieties with *S. tuberosum* with one exception, however, namely the cross *S. tuberosum* x *S. demissum*, where the character was recessive rather than intermediate. The characters of *S. tuberosum*, tuber formation during the long northern day and large sized tubers, were either dominant or intermediate ; whereas the crosses of the non-tuber forming types of *S. demissum* with *S. tuberosum* gave tubers in F_1 but segregation of non-tubers forming types in F_2.
Moreover *S. antilobum*, which under the long northern daylight period produced no tubers, on being crossed with *S. tuberosum* yielded F_1 seedlings with tubers. From all combinations of *S. andigenum* with *S. tuberosum*, in F_1 a considerable number of clones with large tubers, equal at least in size to those of the *S. tuberosum* types, were selected.

435. GIGANTE, R. 633.491–2.8:575
Risultati di un' esperienza sull ' ereditarietà della maculatura interna dei tuberi di patata. (**Results of an experiment on the inheritance of internal spotting in potato tubers.**)
Boll. Staz. Patol. Veg. Roma 1932 : (N.S.) **12** : 275–77.
Observations on specimens of tubers affected with pseudo-netnecrosis (see " Plant Breeding Abstracts " Vol. III, Abst. 238) and exhibiting reddish brown necrotic spots distributed in the phloem parenchyma, but no symptoms in the foliage.
The affected tubers gave plants which were normal in every way, but which subsequently produced a greatly reduced yield of tubers containing from 20–70 per cent of affected potatoes.
The condition is said to be hereditary and transmitted through the sets.

436. CLARK, C. F., 633.491–2.8–1.521.6
STUART, W. and 633.491 Katahdin
STEVENSON, F. J. 633.491 Chippewa
The Katahdin and Chippewa potatoes.
Circ. U.S. Dept. Agric. 1933 : No. 276 : Pp. 7.
The Katahdin and Chippewa potatoes whose pedigrees and botanical characteristics are described are highly resistant to mild mosaic and yield tubers of excellent shape, with shallow eyes and of good culinary quality. The Chippewa, though not classed as an early variety, has the added advantage of maturing earlier than other late maturing varieties.

437. 633.494–1.541:633.854.78
SHKREBTIENKO, T. S. 633.494–1.541:581.141.6
(**Seeds of Jerusalem artichokes on sunflower.**)
Nauk. Zapiski Tsukr. Prom. 1932 : Year **9** : Bk. 16/17 : 243–46.
Attempts to obtain seed from artichokes by shortening the period of daylight and by traumatic injury having failed, the effects of grafting artichokes on sunflowers (*Helianthus*) were investigated.
Grafts from the middle portion of the artichoke grafted on the upper part of an adult sunflower formed early buds and flowered on August 25th, bud formation continuing until late autumn. On three well developed branches 101 heads were formed and after pollination by bees between 45 and 52 seeds set on each head. The seeds resembled those of the sunflower. The budding of grafts from parts other than the middle of the plant was much retarded, e.g. until 15th September or 20th October, and hardly any tubers were formed.
Reciprocal grafts were less successful, the sunflower developing slowly and forming only a small head.

438. Breslavets, L., Medvedeva, G. and Mágitt, M. 633.5:576.312.34
(Cytological investigations of bast plants. II *Apocynum*, ramie, *Hibiscus cannabinus*, *Abutilon*, Sunn, *Hibiscus esculentus*.)
Bull. (Trudy) New Bast Fibres Res. Inst., Moscow 1933 : **2** (2) : 142–48.

In *Apocynum venetum* 22 chromosomes of more or less identical form were observed at metaphase. In some specimens of the chromosomes displayed slightly more individuality, one pair of large chromosomes being easily distinguishable. The chromosome condition in *A. cannabinum* was entirely similar. One unnamed specimen differed so clearly from the other *Apocynum* specimens examined that it was thought to belong to a different species, hybrid or mutant.
Boehmeria nivea contained 7 pairs of large, 4 of medium and 3 of very small chromosomes. No further distinctions between the chromosomes could be made.
In *Hibiscus cannabinus* the large number of chromosomes (36) made their identification impossible, although clear morphological distinctions between them existed.
Abutilon avicennae was characterized by the presence of several nucleoli and 42 chromosomes, some larger, some smaller.
Crotalaria juncea displayed a number of cytoplasmic inclusions, apparently of a protein nature. The chromosomes are large and four pairs are clearly distinguishable by their size and form.
In *Hibiscus esculentus* 130 chromosomes of extremely small size were observed.

439. Taschdjian, E. 633.51:575
Die Züchtung der Baumwolle. Eine bibliographische Monographie. **(Cotton breeding. A bibliographical monograph.)**
Z. Züchtung 1933 : A **18** : 627–72.

This monograph embodies the author's notes on the literature of cotton breeding during three years spent in theoretical and practical research on that subject.
The morphology and development and biology of the flowering of *Gossypium*, fertilization and the occurrence of cross-pollination are described in some detail, after which a section on variability is treated under the following three heads :—(1) systematic classification and description of the genus and its component species ; (2) the classification of cultivated varieties—and here Brown and Colling's table of Upland varieties is given with Boone's lists of varieties classed according to time of maturity ; (3) variability within a variety ; this section contains the main facts ascertained by various investigators on yield, quality, time of maturity, resistance to frost, drought, disease, pests and weather, trueness to type, uniformity, habit and other factors affecting cultivation and yield.
The various correlations found in cotton and the recorded cases of mutation are briefly mentioned.
The most important publications on genetic work are tabulated to shew the material used, results and authors' names ; while species crosses and the expression of dominant and recessive factors are discussed and the existing data on chromosome numbers and linkages briefly cited.
The following methods of breeding are described : acclimatization, mass selection (in which the application of Brown's system of evaluating yield and other characters is recommended), individual selection (of which various methods are described in detail, as well as the official American method of obtaining a sample of staple for a commercial test).
Freeman's suggestions for the various techniques of artificial selfing and hybridization conclude the monograph, to which a list of 160 references is appended.

440. 633.51:575:581.45
Ware, J. O. 633.51:575.11.061.6
Genetic relations of red plant color, leaf shape and fibre colors in Upland cotton.
Bull. Ark. Agric. Expt. Sta. 1933 : No. 294 : Pp. 60.

Plants homozygous for green, normal shaped leaves and green lint were used as the female parents in a large number of crosses with red plants homozygous for okra shaped leaves and white lint.

The F_1 was intermediate and rather uniform. In the F_2 when the 3 character pairs were studied as a trihybrid and also when any two of the three were analysed as dihybrids, the results invariably indicated independent assortment of all 3 pairs. This finding was confirmed by various backcrosses and by the behaviour of those families bred in F_3 and F_4.
A certain range observed in the degree of colour in homozygous red and heterozygous dilute red suggested the possibility of the action of modifiers within the species.

441. Horlacher, W. R. and Killough, D. T. 633.51:575.243:537.531
Progressive mutations induced in *Gossypium hirsutum* by radiations.
Amer. Nat. 1933 : **67** : 532–38.
The progressive mutations from forked leaf shape to normal produced in cotton, *Gossypium hirsutum*, by X-ray treatment of the dry seeds and from virescent yellow leaf and plant colour to normal green leaf and plant colour, have been described. (See " Plant Breeding Abstracts " Vol. II, Abst. 262.)
Genetic evidence is here presented to shew that these two mutations have been transmitted to succeeding generations.
The colour mutation is regarded as particularly interesting since it represents the reversal under X-rays of a mutation that had previously occurred in nature, i.e. from green to virescent yellow and back again to green.

442. Eichhorn, A. 633.51:576.353
La mitose somatique du cotonnier. (**The somatic mitosis of cotton.**)
C.R. Séanc. Soc. Biol. Paris 1933 : **112** : 260–62.
The appearance of the nucleus before mitosis in cotton is described as being intermediate between the type with " chromocentres " and that with " prochromosomes " already distinguished by the author.
In the resting nucleus there is to be found the large nucleolus to which is attached a small granule of chromatin and a large number of granulations more or less grouped together in twos and threes.
When mitosis commences the granulations unite to form the small and regular chromosomes and mitosis proceeds in a normal way.

443. Armstrong, G. M. and Bennett, C. C. 633.51:677.21:578.08
Some factors influencing the variability in length of cotton fibres on individual plants as shown by the sorter method.
J. Agric. Res. 1933 : **47** : 447–66.
The length of staple when determined by the ordinary method of pulling and combing indicates only the length in one or two of the largest groups of fibres of approximately the same length, and gives no information as to the relative proportions of short or very long fibres present. On the other hand the use of Baer and Johannsen mechanical fibre sorters, when used on samples obtained from seed of a variety grown under known conditions, reveals significant differences. In such material some of the factors affecting lint length were determined. Data on halo length, seed-surface area and volume, boll volume, number of fibres per seed after 25 days of seed development, unit-fibre weight, and sorter distribution of fibres in bolls at approximately 4-day intervals from 25 to 50 days of age, were studied.

444. Simola, E. F. 633.52(47.1)
Linförsöken vid Lantbruksförsöksanstaltens avdelning för växtodling åren 1926–28 och 1930–32. (**Flax experiments by the Plant Culture Division of the Agricultural Experiment Station during 1926-28 and 1930-32 [Finland].**)
T. Lantm. 1933 : No. 11 : 282–83.
The varieties Aino, Marta and Blenda and 5 new lines of flax are at present being tested in Finland. Blenda has a total stem length of 77·7 $\pm$ 0·42 cms. and lines 0812, 0668 and 0812 also fall into the long stemmed group, while line 0811 has the shortest stem but is one of the earliest types

and most productive of seed. The 5-year average for thickness of stem was 1·5 mm. for Aino, Marta and line 0668 and for the remaining strains 1·4 mm. The greatest number of branches was produced by 0811 namely 4·3 ± 1·2 and the lowest number of branches 3·3 ± 0·08 by line 0668. In general the greater was the number of branches the higher was the yield of seed.

445. DILLMAN, A. C. 633.52:576.312.35
Chromosome numbers in flax (*Linum*).
Science 1933 : **78** : p. 409.

The following chromosome numbers have been determined for :—

Linum rigidum Pursh.	n = 15
L. sulcatum Riddell	n = 15
L. perenne Asiaticum (Caspian Sea plains)	n = 9
Flax, Hoshangabad (India)	n = 15
Flax, Bison (N. Dakota Station)	n = 15

446. 633.522:576.312.34
BRESLAVETS, L. 633.522:576.356.5
Cytological investigations of bast plants. I. *Cannabis sativa.*
Bull. (Trudy) New Bast Fibres Res. Inst., Moscow 1933 : **2** (2) : 112–16.

In studying a new crop plant the first problem is to determine the " karyogram " of the material at hand, i.e. the number of chromosomes and their morphological characteristics. In this way it is possible to discover whether the material constitutes a single species or several and the possibilities of crossing when more than one species exists. According to the results of the cytological examination the crossing programme will be planned.

Cytology often helps in discovering whether an unusual form is a mutant or only an extreme variant ; this is especially significant in the case of artificially induced mutations, for only those variants which are dependent upon a fundamental (chromosomal) change are of interest for further study.

In hemp the chromosome number in the cortex = 20, whereas the central cylinder invariably contains 40. Figures are given illustrating the origin of the latter condition in a secondary root by fusion of the nuclei in binucleate cells.

Two chromosomes out of the 20 were distinguished from the rest by their greater size, one being larger than the other ; they are referred to as x and y respectively. Other chromosomes were distinguished by various morphological features. In the cells of the central cylinder each type of chromosome was represented twice and the chromosomes were clearly disposed in pairs of similar type.

This marked tendency to polyploidy is to be put to use in the attempt to obtain new forms of hemp.

447. BUDUGJAN, A. 633.524.3:575.42:519.241.1
(Establishing the most important correlations in Persian *Hibiscus cannabinus*.)
Bull. (Trudy) New Bast Fibres Res. Inst., Moscow 1933 : **4** : 77–88.

An attempt was made to establish those correlations which, owing to their genetic nature, are constant under different conditions of environment. Eighteen varieties and 108 lines were examined from different parts of the Turkestan Breeding Station in 1929, together with 53 commercial varieties from all the main regions of cultivation, 7,600 plants in all being investigated.

The results shewed strong positive correlation of height of attachment of first capsule with length of vegetative period, length of stem and length of petiole, negative correlation of length of stem with tapering, somewhat less marked negative correlation of total weight and length of stem with percentage of bast, and slight positive correlation of height of first capsule with number of internodes. No correlation was observed between height of first capsule and tapering, length of leaf lobe or lower diameter of stem.

On the basis of the characters which by their high correlation proved constant four main types were established. The strong correlation allows improvement to be effected by selection in the field for one or two of the most obvious of the characters, for which purpose height of first capsule and length of stem were chosen.

448. Davis, R. L. 633.61 Mayaguez 28
Variety trials of Mayaguez sugarcane seedlings in 1933. Mayaguez 28 shews wide adaptability.
Agric. Notes P. Rico 1933 : No. 65 : Pp. 7. [Mimeographed].
Mayaguez 28 is regarded as a promising strain owing to its adaptability, spreading and prolific stooling habit, resistance to drought and mosaic, and a high degree of purity, a late to mid-season arrowing habit and comparative freedom from pith in the arrowed stalks.

449. Cross, W. E. 633.61:575.24
Una mutación de la P.O.J. 36 de mayor riqueza sacarina. La P.O.J. 36M.
(**A mutation of P.O.J. 36 with increased sugar content. P.O.J. 36M.**)
Rev. Ind. Agric. Tucuman 1933 : **23** : 47–52.
The cane P.O.J. 36 is the most popular in the country and a close observation has always been maintained in order to detect any variants it might produce. Numerous variants have been found, among them the one here described, which has been under observation since 1927, in which period it has proved almost identical with the original in all respects except for its striped stem and the fact that under identical conditions of growth its sugar content was notably higher, at whatever time it was harvested.
In spite of the higher sugar content the yield of cane was more or less the same.

450. Arceneaux, G., Krumbhaar, C. C. and Bisland, R. B. 633.61:578.081
Testing cane to determine probable milling yield. A method for determining differences in milling qualities between cane varieties in connection with field tests.
Facts ab. Sug. 1933 : **28** : 350–53.
From mill tests with small quantities of sugarcane important varietal differences were demonstrated in several of the eight varieties tested.
Using P.O.J. 213 as the standard, the combined effect of differences in Brix reduction factor, sucrose reduction factor, and total juice extraction on the indicated yield of sugar per ton of cane for each of the other varieties was reduced to a single factor, the " Varietal Correlation Factor."
Varietal correlation factors determined for eight varieties are given.
The value of the method in testing new seedlings in the early stages is evident.

451. 633.61:581.466:575.061.6
Bregger, T. 633.61:581.162.5
The relation of anther color and the proportions of starch filled pollen grains in the sugar cane.
J. Dept. Agric. P. Rico 1933 : **17** : 139–43.
Data collected in 1930 on 15 varieties of sugar cane and in 1931 on 41 varieties seem to shew that the intensity of purple colouration of the anthers is some indication of the fertility of the enclosed pollen grains ; and there is no doubt that of the three classes, varieties with yellow, with medium purple, and with still deeper purple anthers, the last group are to be preferred for use as pollinators. In one variety pollen from field grown plants had a higher percentage of iodine-positive pollen grains and a more intense purple colour than plants grown in drums.

452. Bougy, E. 633.63:575.127.2:633.41:575.11:581.192
Chimisme de quelques hybrides de betteraves. (**The chemistry of certain beet hybrids.**)
Pub. Inst. Belge l'Amélioration Betterave 1933 : No. 5 : 147–226.
The genetic behaviour of the following characteristics among others was observed in crosses between fodder and sugar beets :—lignification, content of sugar and of various other constituents.
The genetic and chemical technique are fully described. The total sugar content appeared

dominant in the F_1 hybrids and even in young plants ; but at the same time the amount of sugar present was dependent on the way in which the cross was made, being greater in the fodder beet x sugar beet cross than in the reciprocal ; moreover, the particular fodder beet parent used also affected the sugar content. In the F_2 to F_4, intermediate types generally approximating more closely to the superior parent as regards sugar content, and very rarely as deficient in sugar as the inferior parent, were recorded. The apparent dominance effect in F_1 was no longer evident in F_2.

The heavy lignification of the F_1 again resembled the sugar beet parent ; and a certain positive correlation of this character with high sugar content in F_1 to F_4 was exhibited, though the interrelationship was not indissolubly linked.

As regards the other chemical characteristics, e.g. the relative proportions of the various constituents, the fodder x sugar hybrids again resembled the sugar beet parent more closely than did the hybrids from the reciprocal cross.

Incidentally some hybrids of cultivated beet with *B. maritima* or *B. trigyna* were made and exhibited high sugar contents.

453. Kovalevskaja, M. F. 633.63:576.356.5:578.08
(The wounding method applied to sugar beet for producing mutations.)
Nauk. Zapiski Tsukr. Prom. 1933 : **10** : 123–32.

Attention is called to various advantages of polyploids, e.g. their greater size and luxuriance in the case of plants cultivated for their vegetative organs, and the fertility in the case of amphidiploids produced from sterile hybrids.

Jorgensen's method of decapitation is described. By a similar method applied to the sugar beet variety Uladovka, the authoress has succeeded in obtaining a number of tetraploid plants from the wound callus. Decapitations were executed at different levels and in different ways, leaving the wounded roots in a warm humid atmosphere, the optimum conditions for callus formation. In 1931, 250 plants were treated and 500 in 1932.

The best adventitious bud formation was obtained from beets grown during the winter in the open and transferred to the greenhouse in the spring immediately after decapitation. The buds developing after such treatment were partly diploid and partly tetraploid. By planting out these buds 21 plants were obtained, of which 9 were tetraploid.

454. Immer, F. R. and Raleigh, S. M. 633.63–1.421
Further studies of size and shape of plot in relation to field experiments with sugar beets.
J. Agric. Res. 1933 : **47** : 591–98.

By the methods of the previous papers by the senior author a field of sugar beets was in 1931 marked out into unit plots one row wide and two rods long. The plot errors were determined for various combinations of unit plots by statistical methods, in order to throw light on the best sizes and shapes of plot for use in experimental work. It is concluded that it is more advantageous to use small plots and replicate sufficiently to reduce error to the level desired, than to use larger plots and fewer replications. If border rows are to be discarded the four row plot is the most efficient. From a contour diagram of heterogeneity it is shown that it would have been impossible to predict the nature of the soil variation before the experiment was done, thus emphasizing the necessity to use replicated trials with randomized arrangements of plots. Correction of the yields for stand was justified by the calculation of the regression of yield on stand, which was shewn to be linear and significant.

STIMULANTS 633.7

455. Garner, W. W. 633.71(016)
Bibliografia selecta sobre el tabaco. **(Selected bibliography on tobacco.)**
Union Panamericana Washington, D.C. 1933 : Pp. 25.

This selected bibliography contains 255 references in various languages bearing on the following aspects of tobacco culture :—soils, pests, general cultivation, physiology, disease resistance, genetics and cytology, and the technological problems of cultivation, etc.

456. GHIMPU, V. 633.71:575.2
Contribuţiuni la studiul variaţiunilor genului *Nicotiana*. (**Contribution to the study of variations in *Nicotiana*.**)
Bul. Cult. Tutun. 1933 : **22** : 3–32.

A number of morphological variations is described in different species of *Nicotiana*, some of which occurred spontaneously and others experimentally induced by infecting the plants with mosaic or covering the young organs with a layer of soil.
A study of the heredity of these variations is in progress.

457. GOODSPEED, T. H. and AVERY, P. 633.71:576.356.2:537.531
Inheritance in *Nicotiana tabacum*. XIII. The cytogenetics of "deformed," an X-ray derivative.
Genetics 1933 : **18** : 487–521.

A plant of *Nicotiana tabacum* var. *purpurea*, treated by X-radiation when almost at anthesis and crossed with normal pollen, produced an X_1 plant with marked structural abnormalities, such as asymmetrical venation which causes distortion of the leaf shape etc. and produces the type of plant designated as *deformed*.
When selfed, *deformed* plants give progeny approximately 50 per cent *deformed*, when crossed with controls none of the progeny is *deformed*.
Among the progeny of the *deformed* plants there occurs the types *long flowers*, *fluted* and *mammoth*, also in combination with *deformed* and with each other. These abnormal types have been observed previously when the F chromosome is present in some abnormal condition. Crosses have been made with the homozygous *coral* plants in which the recessive character *coral*, being carried by the F chromosome, makes a more detailed analysis possible. From the data given of the occurrence of the various types from selfed plants and crosses with the normal, it is clear that quantitative changes in the F chromosome are involved and this assumption is supported by the cytological evidence. Cytological observations shew an attachment between two homologous chromosomes, presumably the F chromosomes, which results in non-disjunction at first anaphase and breakages resulting in the distribution of varying amounts at second anaphase. At mitosis there may also be elimination of all or parts of the F chromosomes, giving rise to the various types of variegation and abnormality observed. Crosses with control plants supply the F chromosome and no *deformed* plants occur but an excess of the F chromosomes gives rise to some of the other types such as *long flowers*.
As a result of this type of chromosome attachment, races transmitting quantitative chromosomal variation have been produced and pure-breeding races too which transmit such recessive characters as *coral* and *mammoth* ; and the " ever sporting " races can also be derived from such a condition.

458. KOSTOFF, D., KENDALL, J. and VASSILIEV, B. 633.71:576.356.4
A polysomic F_1 (*Nicotiana Langsdorffii* x *N. Sanderae*) plant and its progeny.
Bull. Cult. Tutun. 1933 : **22** : 253–69.

Among the approximately uniform first generation from the *N. Langsdorffii* (n = 9) x *N. Sanderae* (n = 9) cross a single plant with 22 somatic chromosomes appeared. Although this individual formed 35 per cent abortive pollen it was highly fertile when selfed 1–2 days before the flowers opened. Meiosis was irregular and led to the formation of monads, dyads, unequal triads, tetrads, pentads, etc. Various types of conjugation occurred during diakinesis, 9 bivalents + 4 univalents being the most frequent.
On selfing this aberrant form in the bud stage, progeny were obtained displaying much greater variability than the progeny of the normal sister plants in size, length of style in relation to anther length, length and shape of leaf, etc. One plant, No. 5, of the 18 F_1 abnormal plants examined had leaves 15 cm. long and only about 2·10 cm. broad, an anomaly attributed to its trisomic constitution represented by 19 somatic chromosomes.
Cytological examination of the 18 above mentioned individuals shewed that gametes with 9 chromosomes and those with more than 9 of the F_1 aberrant plant are viable
A detailed study of the reduction division in plant No. 5 shewed that during the first metaphase the extra chromosome remains more frequently as a univalent, the association of the extra

chromosome in the trisomic plant thus being very similar to that recorded by other workers for the chromosomes of the third set in triploids and hypotriploids of *Nicotiana* and *Petunia*. Meiosis in general was irregular in the trisomic form, unequal triads, tetrads, pentads and even hexads and in a few cases dyads being formed ; and the plant was only partially fertile.
There was a general tendency among the offspring of the aberrant F_1 to resemble the parental plant in their chromosome number ($2n = 22$) but reversions to the original karyotype, $2n = 18$, and all intergradations between these two complements occurred.
The origin of the F_1 polysomic form may have been due to fusion of a normal *Langsdorffii* gamete and a hyperhaploid *Sanderae* gamete due to non-disjunction in *Sanderae*, or fusion of a normal and a hyperhaploid gamete (or of two hyperhaploid gametes) resulting from unfavourable environment interfering with meiosis in both the species crossed.

459. East, E. M. 633.71:581.162.52:575.143
The effect of homozygous genes for self sterility.
Proc. Nat. Acad. Sci. Wash. 1933 : **19** : 841–45.

By artificial fertilization of immature flowers of *Nicotiana Sanderae* and *N. alata* plants were obtained that were homozygous for each of the self-sterility allelomorphs of the series S_1 to S_{15}. The homozygotes were normal in appearance and behaviour, and though they exhibited great variation in germination capacity and in the percentages of good pollen produced, in neither case was this apparently due to the action of sterility allelomorphs. Moreover, out of some hundreds of plants examined only about 3 per cent had less than 85 per cent of apparently bad pollen and even in that small group the defect was not due to any specific S genes.
The S allelomorphs, on being transferred to plants of various genetical constitutions, shewed no abnormal behaviour in combination with particular genetical complexes—the plants were still normal and exhibited the compatibility relationships of the specific S gene involved.
Hence in *N. Sanderae* and *N. alata* none of the S allelomorphs are lethal in the homozygous condition and they behave as ordinary non-lethal mutations though fulfilling their own peculiar physiological role. The author believes their reactions to be analogous to certain immunological phenomena and to consist in specific reactions between the style and the pollen tube when both organs bear the same allelomorph.
In considering the origin of self-sterility a hypothesis is advanced, based on the idea of competition and selective fertilization combined with specific antagonistic reactions between stylar tissue and pollen tube.

460. 633.72:575.42
Korte mededeeling van het Proefstation West Java No. 10. Gegevens voor enkele theezaadtuinen van Tjinjiroean. (**A short report from the Experiment Station West Java No. 10. Data on new tea seed gardens at Tjinjiroean.**)
Bergcultures 1933 : **7** : 897–98.

A descriptive programme for an excursion to the tea seed gardens, certain selection trials, type collections, etc. at Tjinjiroean. The methods of breeding and culture previously discussed (see " Plant Breeding Abstracts " Vol. IV, Abst. 214) are briefly described. The value of individual yield determination by eye is again emphasized.

461. S. J. W. 633.72:581.162
Russische onderzoekingen over bloembiologie van thee. (**Russian investigations on the floral biology of tea.**)
Bergcultures 1933 : **7** : 1035–36.

A Dutch review based on Abst. 707 in Plant Breeding Abstracts 1933 : Vol. III.

FRUIT TREES 634

462. Ellenwood, C. W. and Shoemaker, J. S. 634(77.1)
Dependable fruits. Varieties for commercial and home use.
Bull. Ohio Agric. Expt. Sta. 1933 : No. 528 : Pp. 41.

Brief but useful descriptions and comments on the varieties of apples, pears, quinces, peaches, nectarines, apricots, cherries, plums, grapes, strawberries, raspberries, blackberries, dewberries, currants, gooseberries and blueberries, grown at Ohio Experiment Station or elsewhere in the State. The method used in the Station variety trials is described.

463. KNOWLTON, H. E. 634:581.162.3
Pollination of fruit trees in West Virginia.
Circ. W. Va. Agric. Expt. Sta. 1933 : No. 62 : Pp. 12.
A statement of certain elementary facts of the processes of pollination and fertilization together with remarks on sterility and its causes and practical information on sterility and pollination in apples, peaches, plums and pears. The provision of suitable pollinators, the importance of bees as pollen distributors and certain environmental factors affecting the set of fruit are treated.

464. VEH, R. VON 634.1:581.162.5
Über die Fruchtbarkeit beim Kernobst. (**Fertility in pome fruits.**)
Züchter 1933 : **5** : 199–208.
The decisive factor in fertility is the tendency to fruit formation. This is, in the author's opinion, borne out by the experience of practical horticulturalists as seen from a list of 146 varieties of apples and 85 varieties of pears most frequently recommended by numerous departments of agriculture in 1931. This list shews the various methods of fruiting characteristic of the different varieties, viz. in clusters of 4–6 or of 2–3 or as single flowers. Where possible the ploidy is also given and it is evident that the type of fruiting is independent of differences in the ploidy of the varieties crossed. Moreover, the chromosome relations, however favourable are not the determining factor in the setting of fruit.
The role of fertilization and nutrition in the causation of dying off of blossoms on fruit trees is also regarded as secondary as compared with the absence of the fruit setting tendency which is a species and varietal characteristic.
In investigating the problem of fruit formation mass experiments in artificial pollination must be supplemented by a study of the biological interrelations existing within the individual inflorescence and also of the cytological conditions during the whole developmental process—and not in the pollen mother cells alone.
An exact analysis of the requisite conditions for the setting of fruit is again recommemded. (see " Plant Breeding Abstracts " Vol. III, Abst. 722.)

465. DRAIN, B. D. 634.1/2:575.252
Some observations on bud mutation strains of fruit.
A.R. Me. St. Pomol. Soc. 1931 : 66–70.
A popular lecture on the subject illustrated by reference to bud sports observed in apples and cherries and the derived strains. Many high colour strains of apples have been obtained but some of those selected from the Northern Spy variety lacked vigour. The Fameuse variety has yielded some strains with fruit nearly twice as large as the usual small fruit. From bud mutations in the Montmorency cherry both early and late strains of promise have been selected.
Most bud sports are undesirable in some way and careful selection of variations for propagation is essential.

466. WILLIAMS, A. F. 634.11 McIntosh :575.242
Bud mutations in the McIntosh apple.
Proc. 78th Ann. Meet. N.Y. St. Hort. Soc. 1933 : 249–52.
A short popular lecture describing the striped and blush strains of the McIntosh apple. Sporting from one type to the other is apparently frequent in this variety of apple A tendency to sport from blush to striped rather than in the other direction was observed. The possibility that within colour strains useful mutations affecting quality of fruit and size and productivity of the tree may also be occurring is mentioned.

467. GIBSON, R. E. 634.11:575.25
Chimeras and bud sports.
Trans. Ill. Hort. Soc. 1932 : **66** : 201–11.
Observations on a number of trees of McIntosh apple in an orchard shewed that while more than half of the trees bore only striped fruit and the rest fruit of a solid red colour, on each of these trees there were a few striped apples.
It is suggested that the majority of the variations known as sports are really chimeras and that careful bud selection will do much to improve the variety and to perpetuate desirable variations.

468. KHOMENTOVSKY, G. I. 634.11:581.142:581.162.3:575
(The germinating capacity of seeds as shewn in apple hybridization experiments in the years 1925-1929.)
Bull. Sci. Res. Inst. Southern Horticulture 1932 : No. 16a : Pp. 64.
A total yield of 58,991 seeds received treatment and the average germination of seed from cross and self-pollination of 276 varieties for the five-year period was 60·8 per cent. The varieties with seeds with a high germinating capacity when used as pollen parents are stated also to yield seeds with a high germinating capacity.
Germination capacity in the F_1 from crosses between varieties differing widely in this respect was usually intermediate in type.
As compared with cross-pollination, self-pollination had no reducing effect on the germination capacity.
No correlation was found between germinating capacity of seeds, percentage yield of fruit obtained by hand pollination, pollen germination in a 10 per cent sugar solution and the chromosome number of the varieties used.
It is tentatively suggested that germination capacity is a varietal genetic character.

469. MACDANIELS, L. H. 634.11:581.162.3
The pollination problem in 1931.
Proc. 77th Ann. Meet. N.Y. St. Hort. Soc. 1932 : 37–43.
A brief outline of the practical aspects of pollination especially in New York State, with some facts regarding self-sterility and self-fertility of certain varieties. Among the new varieties of McIntosh parentage recommended as suitable in varying degrees as pollinators for the McIntosh apple are : Cortland, Lobo, Early McIntosh and Kendall. McIntosh and Lobo are also satisfactory pollinators for Cortland.
For the varieties McIntosh and Northern Spy adequate cross-pollination is essential.
The possibilities of hand pollination in commercial orchards are mentioned.

470. HOWLETT, F. S. 634.11:581.162.3:581.162.5
Self- and cross-pollination studies of apple varieties, particularly Rome Beauty and Gallia Beauty.
J. Agric. Res. 1933 : **47** : 523–37.
Experiments on self-fruitfulness, extending over eight years with Rome Beauty and four years with Gallia Beauty shew that both varieties produced an appreciable number of fruits from selfed flowers, but the varieties may be termed only partially self-compatible since in no case was the percentage of fruit equal to a full crop.
Rome Beauty and Gallia Beauty produced an appreciable number of fruits when selfed, but under the most favourable nutritional conditions only 25 to 50 per cent of a full crop was produced. McIntosh, Jonathan, Golden Delicious, Starking, and Red Spy were effective pollinators of Rome Beauty and Gallia Beauty. Melba was effective as a pollinator of Rome Beauty.
The failure of the triploid Arkansas x the diploid Grimes Golden cross was confirmed.
Baldwin produced an appreciable set of fruit when selfed, whilst Delicious proved self-unfruitful and Starking failed to produce fruit when used as a pollinator of this variety.
Jonathan, Gallia Beauty, Cortland and Golden Delicious were all equally effective pollinators of Delicious. McIntosh shewed a low degree of self-fruitfulness whereas under good conditions, Jonathan flowers exhibited a self-fruitfulness equivalent to 25–50 per cent of a full crop.
Owing to the low germinating capacity of their pollen Minkler and Turley (probably a triploid) were ineffective on Jonathan or the other varieties on which they were used. Turley displayed a low degree of self-fruitfulness. Delicious and Jonathan were effective pollinators.
The question of seasonal variation in self-fruitfulness is discussed.
From the positive correlation invariably found between poor germination and low set of fruit in these experiments it is concluded that the value of a variety as a pollinator can often be predicted before cytological examination of the pollen has been made.

471. FRICKHINGER, H. W. 634.11–2.42–1.521.6(43)
Ueber die Mehltauanfälligkeit unserer Apfelsorten. **(The mildew susceptibility of our apple varieties.)**
Umschau 1933 : **37** : p. 667.

Of 109 varieties only 21 have shewn themselves resistant. Observations shew that the severity of the attacks varies according to the district and there is a marked correlation between climate and the disease.

The attack is the more severe the higher the rainfall of the preceding February and the lower the rainfall of the October of the previous year.

472. 634.2
WELLINGTON, R. 634.8
New varieties of peaches, cherries, and grapes.
Proc. 78th Ann. Meet. N.Y. St. Hort. Soc. 1933 : 282–85.

Report of a short descriptive talk on varieties (some new) of peaches, cherries and grapes grown at the Geneva and other Experiment Stations.

473. SHAMEL, A. D., POMEROY, C. S., CARYL, R. E. and HARMON, F. N. 634.22:575.252
Bud variation in the Agen prune.
J. Hered. 1933 : **24** : 288, 289–92.

Instances of limb variation in the Agen prune (*P. domestica*) are recorded. In one mutation the large secondary branches bore larger and more oval shaped fruits than the normal ; another limb variation was characterized by almost complete barrenness, and a third by late ripening.

All three varieties were transmitted through bud propagation to progeny trees.

The phenomenon would appear to be frequent and the possibility of improving the Agen variety by selection of favourable bud variations and of budwood from consistently high yielding trees producing uniformly desirable fruits is indicated.

474. GALLI, P. 634.22:581.162.5
Ricerche sperimentali sull'autosterilità del susino "Burbank." **(Experimental researches on the self-sterility of the "Burbank" plum.)**
Boll. R. Ist. Sup. Agr. Pisa 1931 : **7** : 185–202.

Whole trees of Burbank were isolated by means of a covering of fine gauze or two trees were isolated together or one or two branches on a tree were left free while the rest of the tree was enclosed in gauze As a result of these experiments no fruit set on any of the isolated trees or branches but there was abundant fruit on the branches left free.

Among the other varieties of plum cultivated in the same orchard was Santa Rosa, a known pollinator of Burbank.

It is therefore concluded that in Italy, as in America, the Burbank is self-sterile.

475. GALLI, P. 634.22:581.162.52
Nuove ricerche sperimentali sull'autosterilità del susino Burbank. **(New experimental investigations on the self-sterility of the Burbank plum.)**
Boll. R. Ist. Sup. Agr. Pisa 1932 : **11** : 375–89.

The experiments described were devised to meet the criticisms of an earlier paper on the self-sterility of the Burbank plum.

In the first set of experiments the trees were transferred to pots and grown under optimum conditions. Branches of Burbank were isolated before the buds opened by a covering of gauze and (a) anthers removed and the flowers pollinated with pollen of the variety Santa Rosa, (b) the same without removal of the anthers, (c) self-pollinated without emasculation and (d) a branch partially isolated was left to itself as a control. The coverings were removed when the petals had fallen.

On March 5th there were 74 fruits the size of an olive on branch (a), six fruits on branch (b) and none on (c) or (d). From which it is concluded that the variety Burbank is self-sterile and that Santa Rosa is one of the best pollinators. In a second series of experiments whole trees of Burbank were isolated with whole trees of Santa Rosa. The trees of Santa Rosa set abundant fruit but only a very few fruits set on the Burbank.

476. 634.22:581.162.52
PIROVANO, A. 634.22:575.127.2:634.25
Sulla autosterilità del più fertile susino. (**On the self-sterility of the most fertile plum.**)
Ital. Agric. 1933 : **70** : 1081–83.
Although the self-sterility of the Burbank has been fully demonstrated, the fact remains that trees of Burbank may set abundant fruit though growing far removed from any other variety of plum.
Experiments shew that a considerable quantity of fruit is set when Burbank is pollinated with the peach, Mamie Ross, or with pollen of *Prunus dasycarpa* which may in part explain the contradictory reports.

477. RIETSEMA, I. 634.22/3:581.162.5
Bestuivingsproeven bij kersen en pruimen. (**Pollination trials with cherries and plums.**)
Bijlage bij verslag Proeftuin der R.K. Land– en Tuinbouwschool te Breda over 1932 : Pp. 5.
A report from another source of the work previously reviewed (Cf. " Plant Breeding Abstracts " Vol. III, Abst. 494).

478. EVREINOFF, V. A. 634.25:581.145.2:575
Les fruits doubles et multiples chez le pêcher. (**Double and multiple fruits in the peach.**)
Rev. Gén. Bot. 1933 : **45** : 326–31.
The different modes of formation of double and multiple fruits in the edible peaches are described. Observations on over 200 varieties shewed that though the number of multiple fruits produced may vary from year to year, the phenomenon is definitely a varietal characteristic. It is stated to be heritable.

479. BLAKE, M. A. 634.25:581.145.2:578.081
New Jersey standard for classifying the set of fruit buds upon peaches.
Circ. N.J. Agric. Expt. Sta. 1933 : No. 271 : Pp. 4.
From observations made during 1930–1933 a classification standard comprising 6 groups has been established on the basis of the number of fruit buds formed per 12 inches of twig growth. The standard is intended for use in breeding and horticultural experiments.

480. BRANSCHEIDT, P. 634.25:581.331.23:575.114
Über physiologische Haplontenspaltung. (**On physiological haplont segregation.**)
Planta (Berl.) 1933 : **21** : 1–11.
In experiments on the peach the phenomenon of physiological haplont segregation was also found in the pollen of the Elberta peach which is thought to belong to the few more or less completely pollen sterile forms of *Prunus persiaca* [sic. ? *persica*] such as J. H. Hale.
Pollen germination tests shewed that segregation into short and long pollen tubed forms occurred in the ratio 49·35 : 50·65 per cent.
Pollen subjected to the effects of aging, on subsequent germination gave again a ratio of approximately 1 : 1 viz. 49·40 per cent with short tubes and 50·60 per cent with long tubes. Hence it is concluded that the genetic basis for germination capacity and tube growth is the same in both types of pollen grains but that the partial expression of this capacity in the short tubed type is due to inhibiting factors. Segregation is factorially conditioned.
Genetic experiments are in progress on the question of the possible behaviour of the pollen on the stigma of its own or a different flower and the behaviour of the pollen tubes in the style. Certain hypotheses are tentatively advanced in the present paper.

481. BLAKE, M. A. 634.25–2.111–1.521.6:575
Elberta and its selfed and chance seedlings lack hardiness.
Circ. N.J. Agric. Expt. Sta. 1933 : No. 287 : Pp. 4.
Seedlings from the self-pollinated of Elberta and from various crosses upon this variety lacked hardiness under New Jersey " open " winter conditions, shewing that Elberta is unpromising as a parent where hardiness in bud is desired. Both Elberta and J. H. Hale even when crossed with more hardy varieties usually give progeny less hardy than the superior parent. There is stated to be strong evidence that J. H. Hale is a seedling of Elberta.

482. SHAMEL, A. D. and TWIGHT, E. H. 634.31:575.42
Puerto Rico seedless orange selections.
J. Dept. Agric. P. Rico 1933 : **17** : 171–81.
Mainly on account of the discovery of four parent tree selections of seedless oranges in Porto Rico, with brief descriptive notes on the individual trees. Though no fruits have yet been produced by the budded progeny their foliage indicates that they are likely to resemble the parent trees in possessing highly desirable flavour, bouquet, flesh, etc., and also attractive sizes and shapes of fruit. Plates illustrate all four selections.

483. EMME, H. and SCHABLOVSKAJA, M. 634.38:575.12
Beitrag zur Frage der *Morus*-Züchtung. (Sammelreferat und eigene Beobachtungen.) [**On the problem of *Morus* breeding. (A survey of literature and the authors' own observations.)**]
Züchter 1933 : **5** : 222–25.
A brief summary of facts from accessible Japanese literature on the cytology and genetics of the mulberry is followed by provisional deductions from hybrids of various races, mainly Japanese, observed by the authors for two years.
It would seem that leaf division as exhibited in the Italia race is a dominant character and homozygous in that race ; whereas the Ogon race and that from Gandzha is apparently homozygous for entire leaf, while the Schumagawa race is heterozygous. No explanation could be found for the fact that Cedrona (entire leaf) x Tatarica (entire leaf) gave entire leaved progeny but the same Cedrona strain crossed by the " Gandzha " race gave an F_1 ratio of 64 entire leaf : 5 divided.
The capacity for developing flowerless lateral shoots was found only in the Lhou and Tatarica races in the initial breeding material but was marked in most of the F_1, and may be due perhaps to heterosis and perhaps even a characteristic of young seedlings only.
All F_1 hybrids shewed delayed swelling of the buds as compared with the parent forms, whereas the opening of the buds was more rapid in the F_1 than in the parents. Environment may, however, have influenced these two characters.
Heterosis is also suggested in explanation of the greater rapidity with which most F_1 hybrids reached the stage when the foliage is completely unfolded.
The stage at which the first leaf was cast was delayed in crosses with Tatarica, Schumagawa, or the race obtained from Gandzha.
The characters relating to " length of the phases of the vegetation period " are regarded as racial characters and can therefore be used in mulberry breeding.
Very high rust resistance was found in a number of F_1 plants, e.g. from Cedrona x Cataneo, Cedrona x Tatarica and other progenies.
The relevant bibliography occurs in the next issue of the journal.

484. REED, C. A. 634.51:575.127.2
Turkeys, men and nuts.
J. Hered. 1933 : **24** : 356–58.
In this review of " Nut Growing " by R. T. Morris the assumption that the " butternuts " or " butterjaps " which are borne by seedling Japanese walnut trees are due to natural crosses with the American butternut is examined and shewn to be a possible explanation in some instances but not universally valid.

485. TRAUB, H. P. and ROMBERG, L. D. 634.521:581.162.3
Methods of controlling pollination in the pecan.
J. Agric. Res. 1933 : **47** : 287–96.
Tests of various methods shewed that controlled pollination may be most successfully effected by covering the pistillate terminal inflorescence with a small, ventilated, finely woven cloth bag impregnated with paraffin of low melting point and having in the neck a cotton wool pad for ventilation and padding for the young shoot. Pollen is injected into the bag by means of a hypodermic syringe.
Halbert pollen was used and there was some evidence that this variety may be to some extent self-incompatible.
Further improvements in the technique are being considered.

486. 634.574:581.162.3
FLACCOMIO, E. 634.574:575.12
La coltura del pistacchio in Sicilia. (**Pistachio cultivation in Sicily.**)
Alpe 1933 : **20** : 339–42.
With the pistachio which is dioecious a large number of male plants (10 per cent) should be planted among the female trees and if necessary artificial pollination by suspending male branches on the female trees or by dissemination of pollen should be carried out. Varieties should be chosen in which the two sexes flower about the same time. The sex of young plants can be determined before flowering by the presence of galls on the male plant.
Pistacia vera can be fertilized by *Terebinthus* and yields a highly useful hybrid.
General directions for cultivation and grafting are given.

487. BEATTIE, J. H. and BATTEN, E. T. 634.58:575.42
Tests of varieties and strains of large-seeded Virginia-type peanuts.
Circ. U.S. Dept. Agric. 1933 : No. 272 : Pp. 4.
Tests from 1929–31 of a large number of strains and varieties of groundnuts shewed that at least 7 strains of the Virginia type not only produced extra large seeds (30–32 to the ounce) or even larger but were also among the 10 highest yielders.
There were, however, also indications that large sized nuts do not always give the highest yield.

488. DARROW, G. M. and LONGLEY, A. E. 634.714:575.127.2:634.71:576.3
Cytology and breeding of *Rubus macropetalus*, the Logan, and related blackberries.
J. Agric. Res. 1933 : **47** : 315–30.
From a botanical study of several hundred Logan seedlings, many Logan crosses with the varieties Lucretia, Young and Mammoth, specimens of Ideal Wild, Cory and other varieties also derived from the western species of wild trailing blackberries along the Pacific coast, and from wild *Rubus macropetalus* material and its crosses with Logan and with various bramble varieties, the authors establish the following three species to include the important forms on the Pacific coast : *R. macropetalus* Dougl., *R. ursinus* Cham. and Schlecht. and *R. loganobaccus* Bailey. Any rare forms so far examined are regarded as crosses between overlapping species. The haploid chromosome number of male plants of the dioecious form of wild *R. macropetalus* was found to be 42 and of male plants of wild *R. loganobaccus* 21, while plants taxonomically similar to *R. loganobaccus* had 28 or 35 chromosomes. In the Ideal Wild variety, which from its characteristics is regarded as probably of hybrid origin from a cross of *R. macropetalus* x the Logan, the haploid number is 28.
The history of the Logan is briefly described.
In contrast to Crane and Darlington's results, material composed of several hundred selfed seedlings shewed only the variation to be expected among the seedlings of a variety of a true species and nearly all of 400 seedlings were productive and not defective. The F_1 seedlings resembled the Logan and not the raspberry and some selected seedlings matured earlier than the Logan and some had a sweeter flavour. Out of 409 seedlings 269 had glaucous and 140 glabrous canes, approximating to a 2 : 1 ratio. The haploid chromosome number of the Logan is 21 ; of 11

seedlings 10 were hexaploid and had 21 chromosomes and one, a pentaploid, had 35/2 and shewed more irregularities in division than the hexaploids and also 50 per cent of aborted pollen grains, whereas the hexaploids had a low percentage of sterile pollen.
Of 164 plants of Logan (n = 21) x Mammoth (n = 21) only 2 were at all productive and even those did not set well; the rest were completely sterile or nearly so. There were no contrasting characters on which to base a study of inheritance. Out of 8 F_1 hybrids 6 had a haploid number of 21 and shewed certain meiotic irregularities indicating incompatibility of the chromosome sets. Two other F_1 plants were pentaploids and shewed considerable irregularities in meiosis and were sterile. The amount of aborted pollen in the 6 hexaploids was also large, which shews that although the chromosome number may be an even multiple of the basic number 7, incompatibility of the parental chromosome sets may lead to an appreciable amount of pollen abortion.
Crosses of Logan x Young (n = 21) gave 148 nearly or completely sterile plants and 2 partially fertile. Of the 10 F_1 hybrids 9 with 21 n chromosomes shewed some irregularities in the reduction divisions. The tenth plant had only 21/2 as its haploid number.
Logan x Lucretia (n = 21) yielded 18 plants sterile or nearly so and 1 partially fertile. The sterility of the pollen from the crosses ranged from slight to 50 per cent. The 9 F_1 hybrids examined had 21 n chromosomes. Irregular meiosis occurred in some plants but not in others.
Plants believed to be hybrids of *R. macropetalus* (n = 42) x Logan (n = 21) gave some perfect flowered fertile seedlings with good sized fruit of fine flavour.
Other western species, *R. spectabilis*, *R. parviflorus* and *R. leucodermis* and also *R. inermis* Willd. of Europe, were found to have each 7 n chromosomes. The chromosome number for various other species were also determined.
From the chromosome behaviour of the Logan in the varietal crosses and when selfed it is concluded that the Logan is not a hybrid but probably originated as a red-fruited perfect-flowered sport of *R. loganobaccus*.
The economic possibilities of crosses of the 3 western species of trailing blackberries are indicated.

489. Darrow, G. M. and Waldo, G. F. 634.715:575.12:581.163
Pseudogamy in blackberry crosses. So-called "false seedlings" produced in hybrids between European and American varieties.
J. Hered. 1933 : **24** : 313–15.

Certain European blackberries differ from American forms in reproducing pseudogamically, the proportion of false seedlings varying in different varieties from 100 to 0 per cent.
Hybridization of the two European varieties Oregon Evergreen (*Rubus laciniatus*) and Himalaya (*R. procerus*) with a number of American varieties as pollen parents shewed the proportion of true seedlings that were to be expected was about $\frac{1}{10}$ in the Oregon Evergreen crosses and $\frac{1}{8}$ in the Himalaya crosses. From one combination Himalaya x Eureka (*R. cuneifolia*) 8 out of 10 proved true crosses; and though the numbers are not statistically significant the author points out that this may be an instance of closely related parents producing true and false hybrids in equal numbers as suggested by Lidforss. For Eureka is the variety most nearly related to the European species and may possibly represent the primitive European type "before the European species became mixed with tropical or southern forms and pseudogamy appeared."
It is suggested that a similar phenomenon in interspecific citrus crosses is perhaps due to a remote hybrid origin of citrus species.

490. Viksne, A. 634.72:575.127
Vorläufige Mitteilung über die Kreuzungsversuche mit *Ribes* 1924–1931.
(Preliminary contribution on hybridization experiments with *Ribes* 1924-1931.)
Acta Horti Bot. Univ. Latviensis, Riga 1931 : **6** : 86–89.

From 1924–1931 a series of hybridizations involving 44 combinations with 22 different forms yielded well developed plants from 8 combinations, the remaining crosses either producing no seed or seed that did not germinate. The successful combinations were :—
I. *R. nigrum* L. ♀ x *R. aureum* Pursh ♂.

II. *R. Grossularia* L. ♀ x *R. utile* Jancz. ; *R. utile* Jancz. x *R. Grossularia* L. ; *R. utile* Jancz. ♀ x *R. niveum* Lindl. ♂ ; *R. " rotundifolium "* ♀ x *R. niveum* Lindl. ♂.
III. *R. " rubrum "* hort. ♀ x *R. nigrum* ♂ ; *R. nigrum* ♀ x *R. " rubrum "* hort. ♂.
IV. *R. nigrum* L. cult. ♀ x *R. Grossularia* L. cult. ♂.
It is interesting to note that group I above represents a cross between the two botanical sections *Eucoreosma* Jancz. and *Symphocalyx* Berland ; group II between the sub-genus *Grossularia* and section *Eugrossularia* Engl. pr. p. ; group III between the sub-genus *Ribesia* Berland and the section *Eucoreosma* Jancz. and group IV between the botanical sections *Eucoreosma* Jancz. and *Eugrossularia* Engl. pr. p.
Marked susceptibility to fungus disease was observed in some of the hybrids.

491. Whitaker, T. W. 634.776.1:576.312.35
The chromosome complement of *Cyphomandra betacea*.
J. Arnold Arb. 1933 : **14** : 113–17.
C. betacea, the so-called " Tree Tomato," has 24 2n chromosomes. Certain irregularities were observed at meiosis in about 50 per cent of the plants examined. These, and the resulting 25 per cent of pollen sterility are, it is suggested to be attributed to the sub-normal temperature at which the plants were grown.
There were indications that the lowering of the temperature reduced the number of bivalents.

492. Gustavo, A. de 634.8:575.42
Cenni di selezione viticola. (**Notes on vine selection.**)
Agric. Razionale 1933 : **5** : 277–81.
Large scale selection of seedlings is necessary for future improvement of vines. The chromosome number for the genera *Vitis* is 2n = 38 with occasional polyploid forms, so that interspecific crossing may readily occur and segregation for numerous characters in F_2 makes it essential to have a large number of plants for observation and selection.
The article contains brief notes on the principal facts of practical value in selection and concludes with a plea for more organized, large scale experiments, the cost of which would be amply repaid by the production of improved and disease immune varieties of vines.

493. Decker, K. 634.835(43)
Zuchtziele für Rebenunterlagen. (**Aims in breeding vine stocks.**)
Züchter 1933 : **5** : 208–13.
The primary need in viticulture in Germany at the present time is the provision of suitable stocks for German climate and soil, not by importing foreign unadapted varieties such as the American hybrids, but by breeding.
The main desiderata in future stocks are (1) Sufficient resistance to phylloxera—both in foliage and root—and also to other fungous diseases (e.g. *Oidium, Peronospora*) ; (2) late production of shoots and a high degree of frost resistance combined with ready and rapid development of the later shoots after spring frosts ; (3) early maturity of wood combined with vigour ; (4) erect habit and short internodes.
The existence of the various forms of phylloxera and their hybrids and their different mode of life must not be ignored. On the other hand relative immunity must suffice regardless of whether the roots are infected to some degree or not.
Stocks should not shew berries and the first buds should be removed from grape producing forms, so that ripening of the wood is not delayed.
The various desirable grafting characteristics are described in some detail, e.g. good capacity for union after grafting, good affinity with the German varieties used as scions, ready and rapid root formation and early maturity of the wood of the scion ; the importance of selecting suitable hybrid varieties is also emphasized.
As regards actual development in the vineyard the following characteristics are desirable :— Biological hardiness based on the vegetative vigour and good root formation, good adaptation to environment and good biological effects on the scion ; and here special emphasis is laid on earliness which has such a marked effect in improving the yield and quality of the harvest.

494. PAPONOV, N. V. 634.835:575.42
(Mass selection of the vine as a method of increasing yield.)
Lenin. Acad. Agric. Sci. Inst. Viticult., Popular Series 1932 : Pp. 23.
A semi-popular account is given of various achievements of breeding in general, and of vines in particular. Reference is made to the frequence of vegetative mutations in vines and the presence in all vineyards of large numbers of unproductive vines, which, moreover, often possess great vegetative vigour and are selected by the unwary cultivator. Off-types are often very frequent also.
The presence of superior types or mutants is equally probable and the necessity for positive selection of the best types is emphasized. The method of carrying out these processes of negative and positive selection are described.

495. KAYER, E 634.835.09
Contribution à l'étude des vins d'hybrides. **(Contribution to the study of the wine from hybrids.)**
Rev. Vitic. Paris 1933 : 233–35.
The analyses of the wine from a number of hybrids are given.

496. RAVAT, J. F. 634.835.094
Hybrides producteurs directs. **(Direct hybrid producers.)**
Rev. Vitic. Paris 1933 : **79** : 265–68.
Further notes on the choice and cultivation of direct producers.

497. RACAH, V. 634.836.76
Un ottimo portainnesti a torto negletto : il 554–5. **(An excellent, unjustly neglected stock : 554–5.)**
Ital. Agric. 1933 : **70** : 985–88.
The stock here described is a hybrid of *Aestivalis-Monticola* x *Riparia-Rupestris* and is remarkably resistant to drought and to the chlorosis caused by excess of lime in the soil.
It can be grown successfully on soils containing 80–85 per cent of lime.

498. PIROVANO, A. 634.851:575
Sulla eredità in *Vitis vinifera.* **(On heredity in *Vitis Vinifera.*)**
Ann. Tecn. Agrar. 1933 : **6** : Pp. 60.
A large number of crosses between varieties of *V. vinifera* have been made and their progeny studied to determine how the various types behave. The characters dealt with were those of colour, taste, vigour, etc. and certain vegetative characters and a knowledge of their inheritance should help the plant breeder in the selction of parent stock and also in determining which varieties are homozygous for the characters concerned.

FORESTRY 634.9

499. DENGLER, A. 634.972:575
Die Aussichten einer forstlichen Pflanzenzüchtung. **(Prospects of applying plant breeding in forestry.)**
Z. Forst- u. Jagdw. 1933 : **65** : 83–93.
In contrast to Professor Busse's view (see " Plant Breeding Abstracts " Vol. III, Abst. 744) the writer holds that the application of plant breeding methods in sylviculture is impracticable for the following reasons. In forest cultivation it is not essential that all individuals should be of the best quality, since owing to the process of thinning, relatively few trees per unit area reach the final stage and are ultimately utilized for timber. Attempts to raise the general average of the population are therefore pointless. Moreover it is immaterial whether the comparatively small number of good trees for ultimate use are superior owing to their genotype or their environment.
Though the influence of mutation is regarded as negligible, the action of natural selection is admitted and must lead, it is claimed, to the survival of the most vigorous types.

Though Cieslar's work on the inheritance of form in climatic races of the oak is referred to, again the presence of genotypically inferior forms is stated to be of slight importance provided they are not too numerous to be ultimately eliminated by thinning. The latter process combined with visual selection (which it is claimed may attain a high degree of accuracy in the expert observer) is regarded as the best means of forest improvement.
In general, breeding for immunity is rejected as impossible owing to the length of time required, except in the case of resistance to leaf cast which is detectable during the first year of life. Immunity breeding should, however, be done on a small scale owing to the expense involved.

500. SAX, K. 634.972:575.127.2:576.312.35
Species hybrids in *Platanus* and *Campsis*.
J. Arnold Arb. 1933 : **14** : 274–78.
P. acerifolia, the fertile and hardy hybrid of the cross *P. orientalis* x *P. occidentalis*, has 21n chromosomes, the regularity of whose behaviour at meiosis suggests that the chromosomes of the parent species are very similar and though the genus is one of the earliest dicotyledons known the chromosomes can have undergone no very fundamental change for a long period of time.
C. Tagleabriana from the cross *C. radicans* x *C. chinensis* has 20 n chromosomes which behave regularly at meiosis but 50 per cent of the pollen is sterile, due, it is suggested, to segmental interchange between non-homologous chromosomes in one or both of the parent species.

501. FIORI, A. 634.972.1:575.12
Di alcune varietà e degli ibridi e meticci di "*Quercus Robur*." (**Some varieties of hybrids of "*Quercus Robur*."**)
Alpe 1930 : **17** : 365–66.
Attention has already been drawn to the polymorphism of this species. A number of these so-called varieties is briefly described and mention is made of crosses between them and other varieties.

502. TRELEASE, W. 634.972.1:575.255
An unusual chimaera.
Proc. Amer. Phil. Soc. 1933 : **72** : 241–44.
An apparent example of the appearance of chimaeric segregation in a presumed seed hybrid from a natural cross between a bur oak and a white oak. Two branches from the hybrid tree shewed definite segregation of the two types of fruit characteristic of the supposed parent forms.

503. FOSTER, R. C. 634.972.2:576.312.35
Chromosome number of *Acer* and *Staphylea*.
J. Arnold Arb. 1933 : **14** : 386–92.
The basic chromosome number of the 13 species and varieties of *Acer* and the 4 species of *Staphylea* examined is 13n. A polyploid series has been found by the author and previous workers in both genera. Low chiasmata frequency, regularity of behaviour and secondary pairing is found to be characteristic of the chromosomes of the two genera.
Some species of *Acer* shew a high percentage of poor pollen.
On the basis of these results a common origin is suggested.

504. WETTSTEIN-WESTERSHEIM, W. von 634.972.3:575.127.2:576.312.35
Die Kreuzungsmethode und die Beschreibung von F_1-Bastarden bei Populus.
(**The method of hybridization and the description of F_1 hybrids of poplars.**)
Z. Züchtung 1933 : **A18** : 597–626.
A successful method for the germination and growing of the seeds is described which should prove of value to those interested in forestry. A technique has also been worked out by which hybrid poplar seed may be obtained in the greenhouse. In brief, the method consists in growing the flower-bearing branches in water, pollinating the female inflorescences and collecting the seed when mature.

A large number of crosses is described. The hybrids of *P. alba* x *P. tremula*, *P. canadensis* and *P. pyramidalis* ; *P. eucalyptus* x *P. canadensis* and *P. tremuloides* x *P. tremula* shewed specially rapid growth. The hybrids of *P. nigra* x *P. lasiocarpa* and *P. Rasumowskyana* x *P. lasiocarpa* have a horticultural value. The difference in the reciprocal crosses *alba* x *tremula* is attributed to genetical differences in the parents.
The somatic chromosome number for *P. alba* and *P. tremula* was found to be 38.

505. Zimmerman, P. W. and Hitchcock, A. E. 634.973
Selection, propagation, and growth of holly.
Flor. Exch. 1933 : **81** : No. 21 : pp. 19, 20, No. 22 : pp. 19, 20.

The information given here applies mainly to *Ilex opaca* Ait., *I. aquifolium* L. or to *I. cornuta* Lindl.
The general fruiting characteristics of the hollies and the distinctive capacity of *I. cornuta* without pollination to set fruit containing, however, only sterile seeds, are mentioned and the possibility of *I. aquifolium* also being able to produce similar fruits is suggested.
In *I. opaca* the sexes can generally be distinguished before flowering by the fact that the pistillate flowers are always solitary, whereas the staminate ones usually grow in clusters of two or more.
The great variation in holly and the necessity for vegetative propagation, where a particular characteristic is desired, are briefly indicated.
Practical directions for propagation from seed and from cuttings are given. Observations of 5,000 seedlings to test their hardiness, fruitfulness and individual variations are in progress, but no detailed results are given.

506. 634.975:575
634.972.3:575
Bericht über die siebenundvierzigste Generalversammlung der Deutschen Botanischen Gesellschaft in Dresden, Pfingsten 1933. (**Report of the 74th General Meeting of the German Botanical Association in Dresden, Whitsuntide 1933.**)
Ber. deuts. bot. Ges. 1933 : **51** : (1)–(28).

At the Annual Meeting of the German Forestry Botanical Society in Dresden, 1933, Professor Münch described some observations for a number of years on the geographical races of the pine, spruce and aspen and on differences in vigour between mother trees and their progeny and also between the various yearly progenies of the individual mother trees.

507. Sax, K. and Sax, H. J. 634.975:576.312.35
Chromosome number and morphology in the Conifers.
J. Arnold Arb. 1933 : **14** : 356–74.

The chromosome numbers of 53 species from 16 genera of Conifers were determined. Twelve pairs of chromosomes were found in all the species of *Taxaceae* examined. Twelve was also the basic number of the *Pinaceae* but *Pseudotsuga* had 13 and *Pseudolarix* 22 pairs of chromosomes. Eleven is the basic number in the *Cupressineae* and in the *Taxodineae*. One variety of *Juniperus chinensis* was tetraploid and *Sequoia sempervirens* a polyploid.
The morphology of the chromosomes of the species in each genus is very similar but there is variation between genera.
The constancy of the species is maintained by differences in time of flowering and by geographical isolation. The average number of chiasmata determined for 22 species from 10 genera of Conifers varies between 2·0 and 2·7, a remarkable constancy compared with the range in *Angiosperms*.

VEGETABLES 635

508. Munerati, O. 635.11:575.242:581.43
Races de betteraves à racine fasciculée. (**Strains of beetroot with fasciculated roots.**)
C.R. Séanc. Soc. Biol. Paris 1932 : **111** : p. 603.

A number of plants of the progeny of a wild beetroot shewed fasciculated roots which occurred as a mass mutation. The plants however all died of cold.

A similar type appeared among the F_2 of a cross between two beetroots with abnormal type of heads. Work is in progress to discover whether there is correlation between these two characters.

509. MAGRUDER, R. and MYERS, C. H. 635.34:575.11.061.6
The inheritance of some plant colors in cabbage.
J. Agric. Res. 1933 : **47** : 233–48.

The problem of the origin of and exact nomenclature for various colour types in cabbage is more fully considered (see Plant Breeding Abstracts, Vol. III, Abst. 526) in relation to the four colours purple, magenta, sun-colour and green, in the present investigation and possible ways of reconciling apparent discrepancies between the results here recorded and those of previous workers are suggested.
The sun-colour x magenta cross gave an all purple F_1, a new type, suggesting a dihybrid basis for purple. Various subsequent crosses confirmed this explanation and the colour phenotypes may be designated thus : SM = purple ; Sm = sun-colour ; sM = magenta and sm = green. The heterozygous forms of purple, sun-colour and magenta, differ from the corresponding homozygous types.

510. 635.34:581.162.3:581.162.52
KAKIZAKI, Y. and KASAI, T. 635.15:581.162.3:581.162.52
Bud pollination in cabbage and radish. Some examples of conspicuous " pseudo-fertility " in normally self-incompatible plants.
J. Hered. 1933 : **24** : 359–60.

Evidence was obtained demonstrating the increase in fertility in the Petsai cabbage (*Brassica pekinensis*) and in the Japanese radish (*Raphanus sativus*) when each of these self-incompatible plants were pollinated while in bud instead of when in blossom. Bud pollination of Petsai gave as the average number of seeds 17·63 as compared with 0.13 from pollination of open mature flowers ; and the corresponding figures for the radish were 2·53 and 0·04 respectively.
At the Saitama Agricultural Experiment Station bud pollination has been successfully used to raise selfed seed from various cruciferous plants since 1929.

511. LESAGE, P. 635.563:575.31"793"
Cultures de 1933 et hérédité d'un caractère physiologique acquis. (**Plants grown in 1933 and the inheritance of an acquired physiological character.**)
C.R. Acad. Agric. Fr. 1933 : **19** : 970–72.

Data are presented (see also " Plant Breeding Abstracts " Vol. III, Abst. 528) from which it is deduced that the earliness acquired by *Lepidium sativum* after a number of generations of cultivation under warm conditions has persisted during a number of generations under cold conditions.

512. ALABOUVETTE, L., and TITARD, A. 635.64:575.125
Sur la possibilité d'utiliser dans la culture de la tomate des hybrides de première génération. (**On the possibility of utilizing first generation hybrids in tomato culture.**)
Sélectionneur 1933 : **2** : 11–14.

The advantages to be derived from heterosis in practical tomato breeding were demonstrated by a series of 12 varietal crosses.
From the vegetative standpoint the F_1 hybrids were superior to the parents in all crosses, but in only four out of the total number of varietal combinations was the yield of the F_1 greater than the parental yield.
Increases of 36, 25 and 40 per cent were obtained, the greatest increase being found in the cross of the two varieties with least morphological resemblance. The yields from the direct and reciprocal crosses and from the crosses of the same variety used as the ♀ with different varieties as pollen parents differed considerably. Earliness too could be increased by heterosis and here again the direction in which the crosses were made were of significance.

Since the F_1 is generally intermediate in type, defects in the individual parents may be counteracted by a choice of varieties, ensuring a suitable recombination in F_1.
The value of the method has been recognized in America and Germany and in the latter country a commercial tomato variety called " Heterosis " is known.

513. BORDAKOV, P. P. 635.655:519.241.1
(The theory of correlation as applied to the breeding of the soybean.)
Bull. Appl. Bot. Leningrad 1933 : Ser. 3 (1) : 195–225.

Although previous investigators have failed to find a linear correlation between oil content and iodine number, it is shewn that a clear correlation does exist, though it takes the form of a curve and not a straight line—with rising oil content the iodine number first rises, then falls again. By making use of this fact strains with a desired iodine number can be selected.
A correlation between the iodine number and cellulose content of the seed was also established. A nomogram is given whereby the iodone value can be calculated from the oil and cellulose content in 80 per cent of cases.
Ash content is also to an extent correlated with iodine number and a strong negative correlation between oil and protein content was observed ; only in two cases was an oil content of over 22 per cent observed in conjunction with a protein content of 45.0 per cent.
Correlations were also observed between oil and cellulose oil and ash, protein and cellulose content and between lecithin and content of protein, oil and various other constituents ; various other correlations are indicated.
The value of these correlations in choosing breeding material is pointed out and the need for study of the physiology of such relationships is stressed. It is thought probable that they also exist in other plants.

514. PESOLA, V. A. 635.656:575.12
Om kombinationsförädling och dess resultat med ärter på Lantbruks försöksanstaltens Avdelning för Växtförädling. **[Results of hybridization work in the improvement of peas by hybridization carried out in the plant improvement section of the Agricultural Plant Experiment Station (Jokioinen, Finland).]**
T. Lantm. 1933 : 226–29, 250–53.

A breeding programme begun about 12 years ago had for its object the production of green table peas, white table peas, fodder peas, green fodder peas and finally a white or green type of pea suitable for table consumption or for fodder, adapted to various regions of Finland. The following varieties are regarded as outstanding among the various strains that have undergone a final test in comparative variety trials.
Aune, a green pea derived from a Concordia x Os. L. 0135 cross was at least equal and in some years superior to both parents in yield, and definitely superior to them in earliness. The size and cooking quality of the peas were good, and the vegetative characteristics satisfactory and the pods well filled.
Ilo, a later maturing white variety, obtained from the cross Gyllen x Early Market gave a lower yield than Gyllen but was more uniform and hardy under varying weather conditions. It is slightly earlier than Gyllen, and has larger kernels and is not inferior in flavour though it takes longer to cook. Its vegetative characteristics are also good.
Among the fodder peas the Artturi variety was obtained by crossing the Danish Marmoerade Glaenö and the Finnish Västfinsk indigenous variety, a combination which gave many outstanding lines. The new form is much superior to its parents in yield owing to the large number of double pods which it produces. It is also 7 days earlier than Västfinsk and 10 days earlier than Glaenö. The Artturi pea has luxuriant foliage, producing also a good yield of haulm. The peas are equal in size to those of Västfinsk, though being fodder peas they naturally cook more slowly and have an inferior flavour as compared with table peas.
Other improved types are described.

PLATE, L. 575.1
Vererbungslehre. Band II. (**Genetics. Volume II.**)
Gustav Fischer, Jena, 1933: Unbound RM. 30, bound RM. 32. Pp. xiv + (555-1232). 155 illus.

The second part of Dr. Plate's work, of which the first part has already been noticed (see " Plant Breeding Abstracts " Vol. III, p. 79) has now appeared. This part deals very fully with the phenomena of sexuality together with so-called general problems, under which category are included, mutation, chimaeras, heterosis, distant crossing and the origin of species and other evolutionary questions. The volume starts with a number of addenda to volume I.

The phenomena are discussed and illustrated by reference both to plants and animals, which greatly enhances the value of the sections on such questions as sexuality, interspecific crosses and heterosis.

The author gives emphatic expression to his own views in certain cases, disposing, for instance, of Fisher's theory of the origin of dominance in a little over a page of the text. The author's zoological bias leads to what many might consider an undue neglect of certain phenomena largely associated with plant species, but the whole work affords an extremely adequate survey of the science of genetics. As in part I, the illustrations are admirably chosen and executed and a selected bibliography on the various sections together with a good index terminate the volume.

STERN, C. 575.116
Faktorenkoppelung und Faktorenaustausch. (**Factor linkage and crossing-over.**)
Handb. Vererbungswissenschaft 1933: 1: Lief. 19 (1, H): Pp. vii + 331. 141 illus.

The nineteenth part to be issued of the " Handbuch der Vererbungswissenschaft " deals in a clear and comprehensive manner with the facts and theories of factor linkage and crossing-over. Without claiming to be an exhaustive study of every aspect, it treats the phenomena very fully from a general point of view and gives abundant illustrations for both plants and animals.

The first and largest section of the book is devoted to intra-chromosomal linkage and crossing-over and a short last section to inter-chromosomal relations.

The literature, with a few exceptions, concludes with that of 1931.

JOLLOS, V. 576.12
Genetik und Evolutionsproblem. (**Genetics and the problem of evolution.**)
Verh. deuts. zool. Ges. 1931: 252-95. Akad. Verlagsgesellschaft m.b.H., Leipzig, RM.3.

The author deals briefly with the difficulties encountered in bridging the gap between the modern conception of genetics and the morphological view of evolution.

He develops the idea that the influence of the plasm may be an important factor in the problem, and cites cases among plants in which differences in the results of reciprocal crosses can only be explained by the influence exerted by the maternal plasm.

Changes in external conditions do modify the morphological features of unicellular and multicellular organisms, but there is reversion to the original form if the initial conditions are restored and the modification is never inherited.

Drastic changes, however, such as very high temperatures, the use of X-rays, etc., produce changes in the genes, expressed as mutations, which in some cases (e.g. *Drosophila*) are definitely directional.

It is therefore suggested that the series of changes which results in the reduction to a rudimentary condition (e.g. limb parts in the reptiles), and which represents the same series observable during embryonic development, only in the reversed order, is due to the directional mutation of a gene and has been induced by the prolonged effect of changed external conditions.

MAINX, F. 577.8
Die Sexualität als Problem der Genetik. Versuch eines kritischen Vergleiches der wichtigsten Theorien. (**Sexuality as a problem of genetics. Attempt at a critical comparison of the most important theories.**)
Gustav Fischer, Jena 1933: RM.5. Pp. 88.

The confusion of ideas, terminology and theory which still reigns in the study of sex phenomena in the plant and animal kingdoms, has led the author to make a review of the whole subject, bringing together the views of different investigators, and by a critical discussion to clarify existing views on sexuality.

The basic facts of genotypic sex determination in the higher plants and animals are stated and then considered in the light of the various theories to which these observed facts have given rise, namely the sex factor hypothesis, Correns and Hartmann's " realizator theory " and Goldschmidt's formula of quantitatively antagonistic sex factor pairs localized in the autosomes and heterochromosomes respectively. A partial reconciliation between the two latter theories is shewn to be possible.

The inheritance of sex in haploid forms, the lower plants and in Protista is discussed at length, with special reference to gametophytic and sporophytic sexuality and multipolar sexuality in fungi.

From an analysis of the phenomena in the gametophyte and in the sporophyte, the fundamental distinction between the " sexuality " of the gametophyte and the " sexuality " of the sporophyte and the consequent necessity for assuming separate genotypic bases for their individual differentiation are emphasized.

The validity of applying the " realizator theory " and Goldschmidt's formula to the simpler phenomena of haplogenetic sex determination is tested, and a purely formal application as an interpretation by analogy is regarded as permissible (except in the case of multipolar sexuality of the *Basidiomycetes*) but inadvisable, since present knowledge of the conditions in haploids can be interpreted by a less complicated factor formula.

The fallacies inherent in the various attempts to formulate a causal explanation of sex on the assumption of essential primary differences between the sexes, which is based on a false analogy between genetic and physiological phenomena, are dealt with, and the work of Joyet-Lavergne and the Bütschli-Schaudinn hypothesis, further elaborated in Hartmann's general theory of sexuality and fertilization, are regarded as untenable.

Hartmann's theory of relative sexuality is shewn to be capable of other interpretations, and some simpler physiological explanation is regarded as more likely to accord with the observed phenomena.

A bibliography of recent work on sex concludes the review.

WOOD, R. C. 63
A note-book of tropical agriculture.
Imp. Coll. Trop. Agric., Trinidad, 1933: 5*s.* 0*d.* Pp. 149.

A miscellany of " facts and figures concerned with tropical agriculture." The information contained in this small volume may well have been collected from time to time as the results of practical experience of the needs of those likely to be confronted with practical problems and without the sources of information so readily available to the agriculturalist at home.

The field covered is wide and therefore necessarily extremely briefly treated in parts.

The best sections appear to be those on weights and measurements, labour, crops, feeding stuffs and cattle and also their rearing and management and the list of scientific advisory bodies in the British Empire.

An index is appended.

YGLESIAS, B. R. 633.73(75.3)
Manual del cafetero Colombiano. (**Manual on Columbian coffee.**)
Litografia Columbia, Bogota 1932: Pp. 399.

An account in popular language of the history of coffee, the botany of the plant with a description of the industrial varieties, methods of cultivation and preparation of the final product with special reference to Columbia.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
by PERCY LUND, HUMPHRIES & CO. LTD.

(862) Wt.P.1434/168/41715. 50. 11/40. P.L.H. & CO. LTD. G.943.

INDEX.

al, M., 312
emine, M., 366
erman, A., 401
bouvette, L., 512
derson, A., 400
onymous, 302, 313, 314, 323, 329-331, 337, 339, 340, 353, 360, 368, 376, 399, 429, 460, 506
eneaux, G., 450
nstrong, G. M., 443
old, B. M., 423
ry, P., 457
yar, V. R., 318

ocock, E. B., 357
asubrahmanyan, R., 344
ten, E. T., 487
ttie, J. H., 487
nett, C. C., 443
duri, P. N., 342
and, R. B., 450
ke, M. A., 479, 481
er, H., 358, 433
dakov, P. P., 513
, H., 406
e, R. D., 298
gy, E., 452
nscheidt, P., 480
gger, T., 451
slavets, L., 438, 446
eger, F., 412
k, R. A., 417
tain, W. H., 335
wn, C. H., 319
nini, V. C., 371
an, A. A., 345
lugjan, A., 447

aghan, A. R., 301
yl, R. E., 473
taki, Y., 385
stiansen-Weniger, F., 354
k, C. F., 431, 436
k, J. A., 395
s, W. E., 449
tis, N., 411

lington, C. D., 296, 405
row, G. M., 488, 489
ie, J. H., 320
is, R. L., 448
ker, K., 493
ing, G. W., 373
gler, A., 499
kinson, S., 299
l, R., 374
man, A. C., 445
brovskaja, E. JU., 407
in, B. D., 465

t, E. M., 459
horn, A., 442
t, C. C., 335
nwood, C. W., 462
ne, H., 483
inoff, V. A., 478

Feistritzer, W., 375
Fiori, A., 501
Flaccomio, E., 486
Flor, H. H., 365
Fore, R. E., 402
Foster, R. C., 503
Frateur, J. L., 348
Frickhinger, H. W., 471

Gaines, E. F., 392
Galli, P., 474, 475
Ganga Ram, P., 302
Garner, W. W., 455
Gates, R. R., 293
Gaudineau, 391
Gescher, N. v., 359
Ghimpu, V., 456
Gibson, R. E., 467
Gigante, R., 435
Goodspeed, T. H., 457
Grieder, A., 408
Gustavo, A. de., 492

Haan, H. de, 352
Hafstad, G.E., 362
Hardenburg, E. B., 430
Harmon, F. N., 473
Hayes, T. R., 338
Hearne, E. M., 305
Hendry, G. W., 422
Hines, L., 421
Hitchcock, A. E., 505
Holmes, S. J., 356
Holton, C. S., 361
Horlacher, W. R., 441
Howlett, F. S., 470
Hudson, P. S., 377
Huskins, C. L., 305

Iljnsky, B., 390
Immer, F. R., 454
Iyer, R. B., 318

Jaganatha Rao, C., 321, 322
Jollos, V., p. 167
Jonard, P., 386
Juachon, P., 426
Jung, E., 404

Kakizaki, Y., 510
Kasahara, Y., 425
Kasai, T., 510
Katayama, Y., 372
Kayer, E., 495
Kendall, J., 458
Kerr, H. W., 326
Khomentovsky, G. I., 468
Kiesselbach, T. A., 400
Killough, D. T., 441
Kirk, L. E., 367
Knowlton, H. E., 463
Kostoff, D., 355, 458
Kovalevskaja, M. F., 453
Krumbhaar, C. C., 450
Kuckuck, H., 419
Kuleshov, N. N., 414

Lesage, P., 511
Levitskaya, V., 390
Lewis, R. M., 306
Li, H. W., 413
Lieber, R., 410
Liepin, T., 349
Livermore, J. R., 346
Longley, A. E., 488

MacDaniels, L. H., 469
Macoun, W. T., 332
Magitt, M., 438
Magruder, R., 509
Mainx, F., p. 168
Medvedeva, G., 438
Melchers, L. E., 363
Menon, T. G., 325
Mercado, T., 426
Miège, E., 396, 397
Miles, L. G., 317
Moritz, O., 380
Muhammad, C. A., 328
Munerati, O., 427, 508
Murphy, H. C., 403
Myers, C. H., 509

Neely, W., 346
Nishiyama, I., 384

Oehler, E., 382

Panduranga Rao, V., 308, 310
Papanov, N. V., 494
Peat, J. E., 316
Pesola, V. A., 388, 514
Peto, F. H., 294
Pillai, V. G., 309
Pirovano, A., 409, 476, 498
Pissarev, V., 378, 434
Plate, L., p. 167
Pomeroy, C. S., 473
Pope, M. N., 420
Powers, L., 421
Pringsheim, E. G., 351
Przyborowski, J., 347

Racah, V., 497
Raleigh, S. M., 454
Ramanatha Ayyar, V., 344
Rangaswami Ayyangar, G. N., 308-310
Ravat, J. F., 496
Reed, C. A., 484
Rhoades, M. M., 415
Rietsema, I., 477
Ritchie, J., 295
Robertson, D. W., 373
Rode, K. P., 311
Roemer, T., 369
Romberg, L. D., 485
Roscoe, M. V., 334
Rubner, A., 381

Sankara Ayyar, M. A., 308-310
Sax, H. J., 507
Sax, K., 500, 507
Schablovskaja, M., 483
Schelotto, B., 393
Schmidt, E. W., 375
Schribaux, E., 379
Schwarz, W., 351
Seidemann, A., 315
Seifriz, W., 350
Selim, Abd El Ghaffar, 319
Shamel, A. D., 473, 482
Shechurdine, A., 383
Shkrebtienko, T. S., 437
Shoemaker, J. S., 462
Sieglinger, J. B., 424
Sikka, L. P. D., 324
Simola, E. F., 444
Singh, C. R., 303
Singh, R. D., 302
Sirotina, M., 428
Smith, E. H. G. 300
Smith, G. S., 395
Smith, W. K., 392, 394
Sprague, G. F., 416
Sprague, H. B., 411
Stakman, E. C., 362
Stanton, T. R., 403
Stern, C., p. 167
Stevenson, F. J., 431, 436
Stuart, W., 431, 432, 436
Subramanyam, P., 307

Talanov, V. V., 418
Taschdjian, E., 439
Tavčar, A., 389
Thompson, J. M., 341
Titard, A., 512
Torssell, R., 398
Traub, H. P., 485
Trelease, W., 502
Tschermak, E., 387
Tubbs, F. R., 327
Tulaikov, N. M., 370
Twight, E. H., 482
Tydeman, H. M., 333
Tyler, L. J., 362

Vassiliev, B., 458
Veh, R. von, 464
Venkatraman, S. N., 307, 322
Verushkine, S., 383
Vijiaraghavan, C., 308-310
Viksne, A., 490
Voelcker, O. J., 300

W....., S. J., 461
Waldo, G. F., 489
Wang, D. T., 364
Ware, J. O., 440
Weiss, F. E., 292
Wellington, R., 472
Wenholz, H., 304
West, J., 300
Wet, A. F. de, 336
Wettstein-Westersheim, W. von, 504
Whitaker, T. W., 491
Williams, A. F., 466
Wood, R. C., p. 168
Woodworth, C. M., 402
Wynne Sayer, M., 343

Yates, F., 297
Yglesias, B. R., p. 168
Youssef, A., 319

Zimmerman, P. W., 505

IMPERIAL AGRICULTURAL BUREAUX

EXECUTIVE COUNCIL.
2, Queen Anne's Gate Buildings, London, S.W.1.

IMPERIAL BUREAU OF SOIL SCIENCE.
Rothamsted Experimental Station, Harpenden, Herts.

IMPERIAL BUREAU OF ANIMAL NUTRITION.
The Reid Library, Rowett Institute, Bucksburn, Aberdeen.

IMPERIAL BUREAU OF ANIMAL HEALTH.
Veterinary Laboratory, New Haw, Weybridge, Surrey.

IMPERIAL BUREAU OF ANIMAL GENETICS.
King's Buildings, University of Edinburgh, Scotland.

IMPERIAL BUREAU OF PLANT GENETICS (FOR CROPS OTHER THAN HERBAGE).
School of Agriculture, Cambridge.

IMPERIAL BUREAU OF PLANT GENETICS (HERBAGE).
Agricultural Buildings, Alexandra Road, Aberystwyth.

IMPERIAL BUREAU OF FRUIT PRODUCTION.
East Malling Research Station, East Malling, Kent.

IMPERIAL BUREAU OF AGRICULTURAL PARASITOLOGY.
Winches Farm, Hatfield Row, St. Albans, Herts.

The Imperial Bureau of Plant Genetics

Director : PROF. SIR R. H. BIFFEN, M.A., F.R.S.
Deputy Director : P. S. HUDSON, Ph.D.
Assistants :
MRS. R. M. INGHAM, M.Sc.
MISS M. L. C. WILSON, Sen. Mod. B.A.

IMPORTANT NOTE.—Every effort is made by the staff of the Imperial Bureau of Plant Genetics to make Plant Breeding Abstracts as complete as possible and to include all papers referring to plant breeding or the genetics of crop plants with the least possible delay after publication. In order to ensure this authors are invited to send copies of their papers immediately on publication to the Deputy Director.

Plant Breeding Abstracts are issued quarterly at an inclusive price of 15/- per annum, single copies 5/-. Subscriptions or exchanges should be sent to the Deputy Director, Imperial Bureau of Plant Genetics, School of Agriculture, Cambridge, England.

The following publications of the Bureau are available at the prices indicated :

	s.	d.
Wheat Breeding Bibliography, Part I ...	1	6
" " " Part II ...	2	6
Oat Breeding Bibliography	1	6
Rye Breeding Bibliography	1	6
Barley Breeding Bibliography	1	6
Bibliography on Breeding Sorghums and Millets	1	0
Rice Breeding Bibliography	1	6
Breeding Varieties Resistant to Disease ...	2	0
Lodging in Cereals		6
Bibliography on Interspecific and Intergeneric Hybridization in Relation to Plant-Breeding	2	0
Account of the Research in Progress in the British Empire	3	6
Subject Index to Vols. I and II of "Plant Breeding Abstracts"	2	6
Vernalization or Lyssenko's Method for the Pre-treatment of Seed	2	6
Plant breeding in the Soviet Union. Achievements, organization and future programme of the Institute of Plant Industry	3	6
Bibliography of Baking Quality Tests ...	2	6
Summary of Reports received from countries exclusive of the British Empire, 1928-31. Supplement I.	2	6